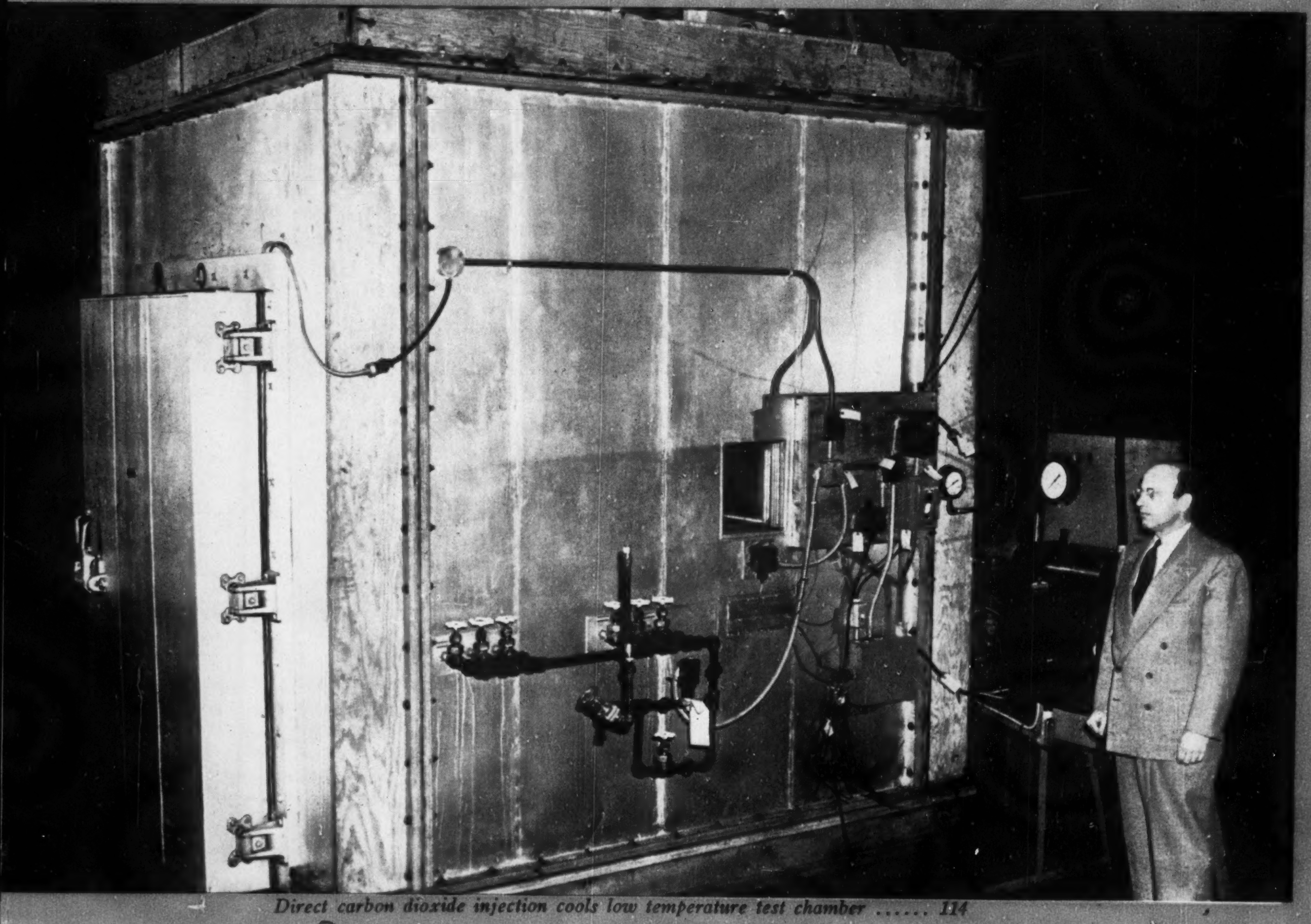
Heating Piping & Air Conditioning

JUNE 1954

INDUSTRIAL • COMMERCIAL • INSTITUTIONAL • PUBLIC BUILDINGS

Page 143—Journal Section of The American Society of Heating and Ventilating Engineers



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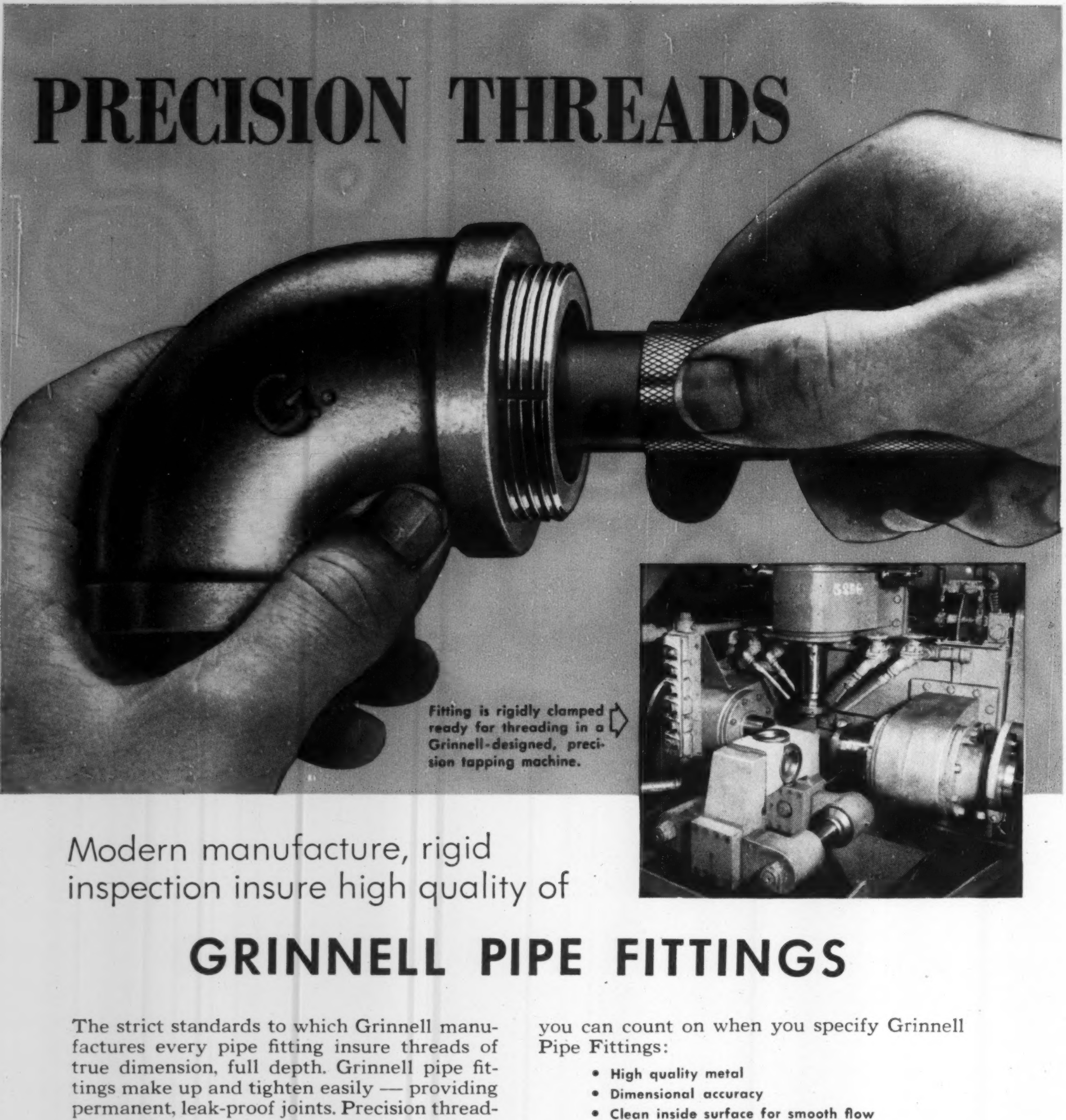

Fitting is rigidly clamped ready for threading in a Grinnell-designed, precision tapping machine.

Modern manufacture, rigid inspection insure high quality of

GRINNELL PIPE FITTINGS

The strict standards to which Grinnell manufactures every pipe fitting insure threads of true dimension, full depth. Grinnell pipe fittings make up and tighten easily — providing permanent, leak-proof joints. Precision threading machines, operated by experts, assure the maintenance of these high standards.

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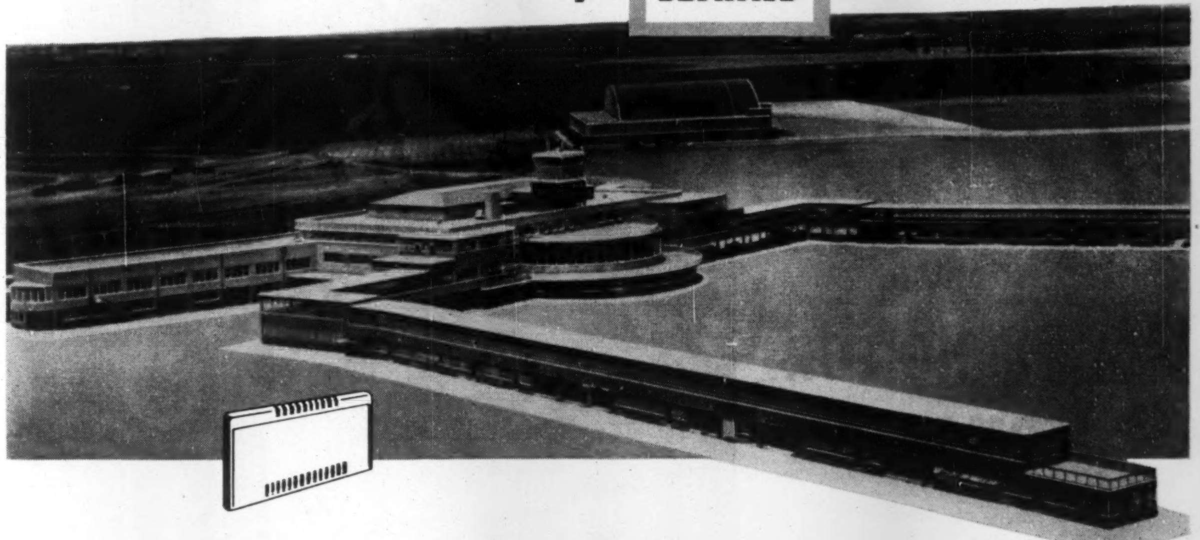
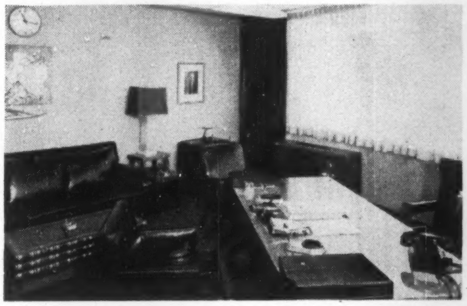
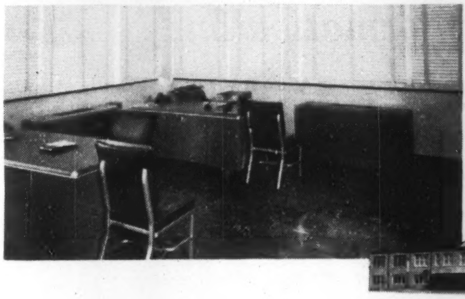
Offices in $14,000,000 Fort Worth Airport cooled and heated by usAIRco Modu-aire



67 usAIRco Modu-aire units supply individually controlled cooling and heating to each office in Amon Carter Field terminal and American Airline's combination hangar and office building.





Modu-aire is individually controlled, circulating cool or warm air to provide the desired temperature in each room. Hot or cold water is furnished from a central supply source and is distributed to each Modu-aire water coil by means of copper tubing within the walls.

The Fort Worth Airport has been planned with an eye to possible future expansion. All facilities from the lobbies to the runways, are designed so that they can be doubled in size. Modu-aire is particularly adaptable to this forward looking plan because the copper tubing is used instead of costly ductwork. Additional Modu-aire units can be installed without the expense and disturbance of tearing down walls.

The engineers for Amon Carter Field are Yandel, Cowan & Love. General Engineering Company, mechanical contractor, installed the air conditioning systems.

AMERICAN AIRLINES

For further literature on Modu-aire write Dept. HP 64

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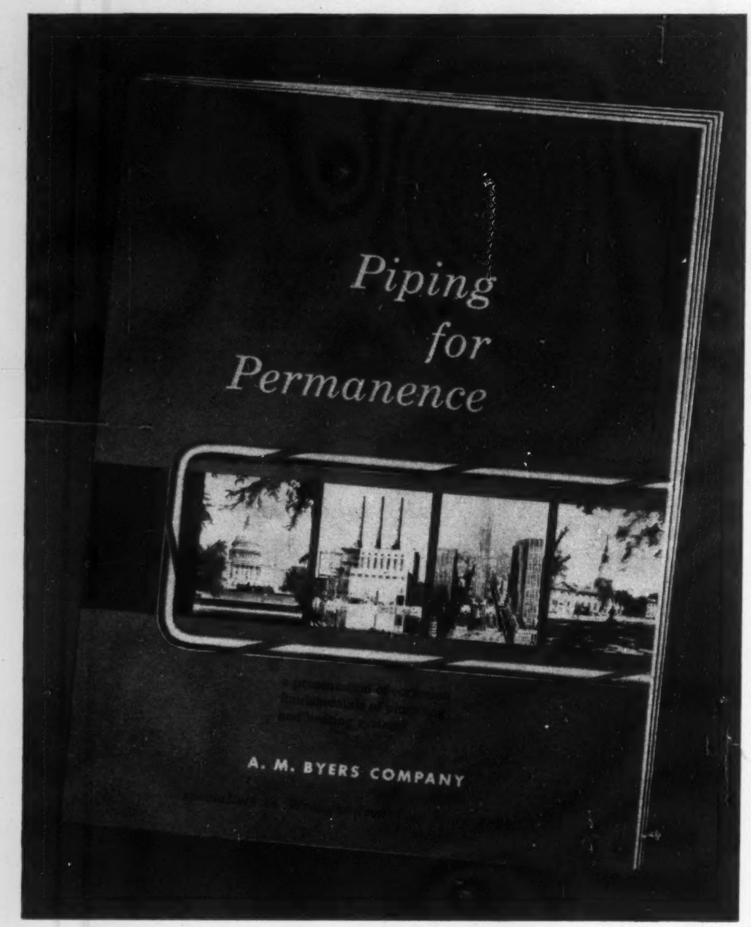

The nature of piping problems in heating and plumbing systems, and the methods by which they can be solved, are discussed in detail in this 32-page Bulletin.

Prepared by our Engineering Service Department, this Bulletin is based on the information we have gathered from analysing complete data on thousands of piping installations of every type, under all kinds of conditions. This pool of experience has been condensed between covers in a clear, easily followed story to help you realize greater piping economy in your installations.

The bulletin also includes a roundup of wrought iron pipe installations from every part of the country and presents practical evidence of the results obtained from the use of the material. These past service records are providing leading engineers everywhere with a practical guide for today's selection.

Your copy is ready. Write for it today.

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WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS

Heating Piping & Air Conditioning

Vol. 26 No. 6

(with which is merged the Aerologist)

DESIGN, INSTALLATION, OPERATION AND MAINTENANCE IN INDUSTRIAL, COMMERCIAL, INSTITUTIONAL AND PUBLIC BUILDINGS

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Alco Multi-Outlet Thermo Valve

This one simple control does the work of many small valves or expensive distributor headers.

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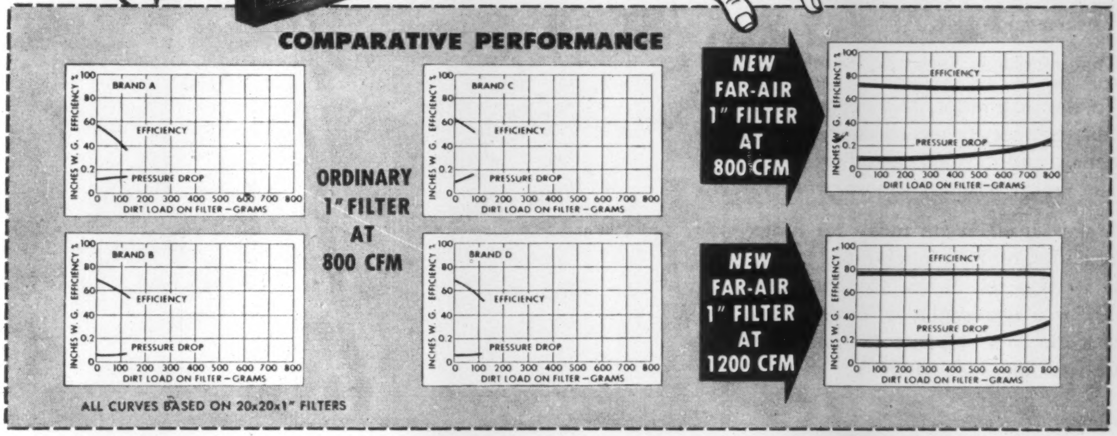
—can be used at either high or low velocity



These graphs show actual performance of the new FAR-AIR High-Low Velocity 1" Filter as compared to performance of ordinary types under identical conditions. In addition, it delivers half-again as much clean air because of 50% greater capacity.

Permanent, scientifically designed and ruggedly built, it eliminates the necessity for never-ending replacements. No longer need you put up with poor performance as ordinary 1" filters approach the useless point.

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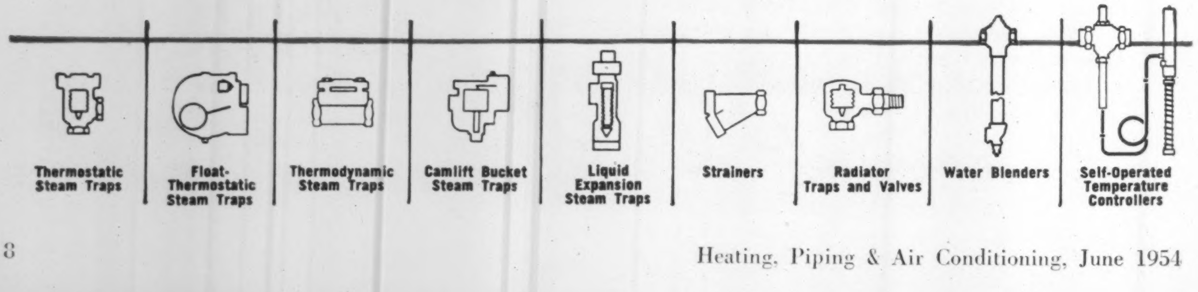
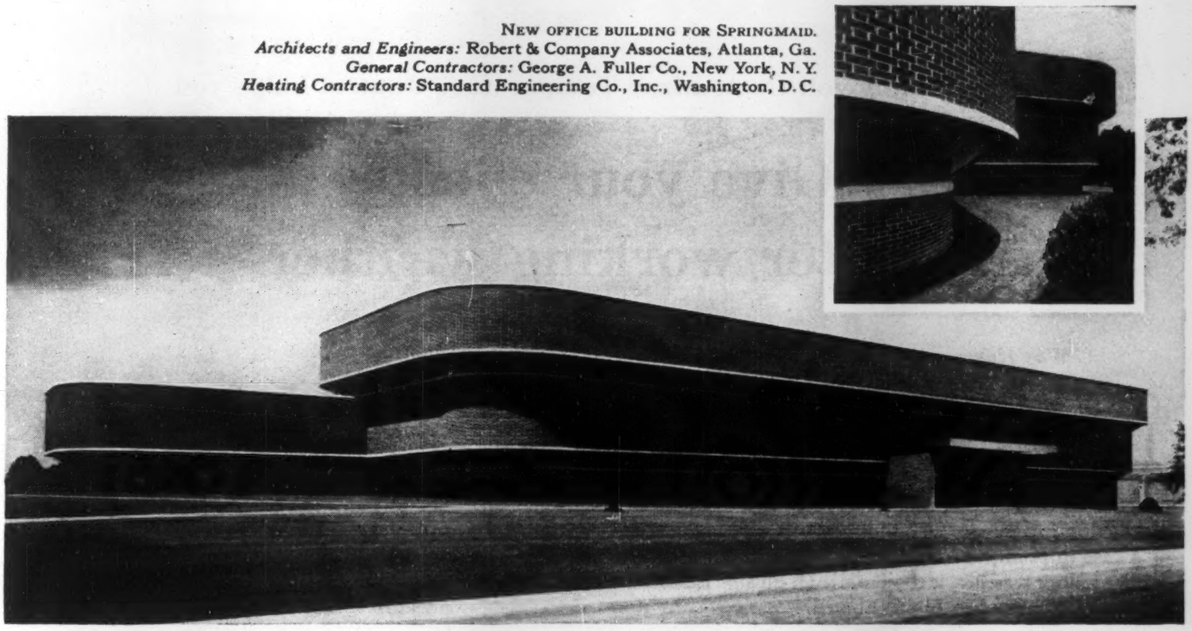

Thermostatic Steam Traps
Float-Thermostatic Steam Traps
Thermodynamic Steam Traps
Camlift Bucket Steam Traps
Liquid Expansion Steam Traps
Strainers
Radiator Traps and Valves
Water Blenders
Self-Operated Temperature Controllers

New office building for Springmaid.
Architects and Engineers: Robert & Company Associates, Atlanta, Ga.
General Contractors: George A. Fuller Co., New York, N. Y.
Heating Contractors: Standard Engineering Co., Inc., Washington, D. C.



SARCOTHERM *Controls Radiant Heating System*

in Springmaid's Unique Home Office

Upside-down windows, "floating" ceilings, and radiant heated walls tell the story of Springs Cotton Mills' remarkable new building in Fort Mill, S. C.

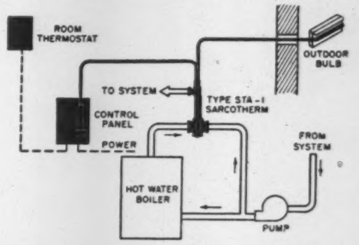
Sarcotherm weather modulated controls were specified for the building's unusual heating system which operates through radiant panels installed in the walls. The system is divided into seven zones, each of which is regulated by a Sarcotherm Indoor-Outdoor control. Thus each zone is assured comfort regardless of location and outside temperature conditions.

Sarcotherm provides a simple, low-cost way of achieving accurate, sensitive control of radiant and hot water heating systems. Coupled to these distinct advantages is Sarcotherm's extensive engineering service which can help you design and install the most efficient and trouble-free system possible.

A Sarcotherm heating engineer will be happy to talk over your next project with you. For complete details on Sarcotherm weather modulated controls contact your nearest Sarcotherm representative, or write direct to Sarcotherm Controls, Inc., Empire State Building, N. Y. 1, N. Y.

SARCOTHERM CONTROLS, Inc.

An Affiliate of SARCO COMPANY, INC.



Typical of the Springmaid installation is this hookup. Proportioning type mixing valve continuously modulates water temperatures.

TAKE ADVANTAGE OF SARCOTHERM'S UNUSUAL ENGINEERING SERVICE

In a Class By Itself—Sarcotherm's engineering service begins with the inception of the job, *carries through* every step of the way.

Complete Installation Drawings and Wiring Diagrams—not just general drawings but complete, tailor-made Sarcotherm drawings and diagrams for each individual job.

On-the-Job Help—your contractor gets Sarcotherm's full cooperation and technical assistance backed by many years of specialized experience.

Weather Modulated Controls for Hot Water, Radiant and Steam Heating Systems

How Honeywell Customized Temperature Control helps you

Give your clients better working weather

Why Honeywell Customized Temperature Control is becoming a "must" in all types of buildings

THE importance of good "working weather" *inside* a building is coming to be appreciated by a growing number of people concerned with promoting efficiency and satisfaction in all types of buildings.

A case in point, which tells how to insure proper indoor weather, is the Emmie U. Ellis Junior High School in Elgin, Illinois.

Today—as demonstrated by the Ellis school—the best way to provide proper temperature control is through the use of *Honeywell Customized Temperature Control.*

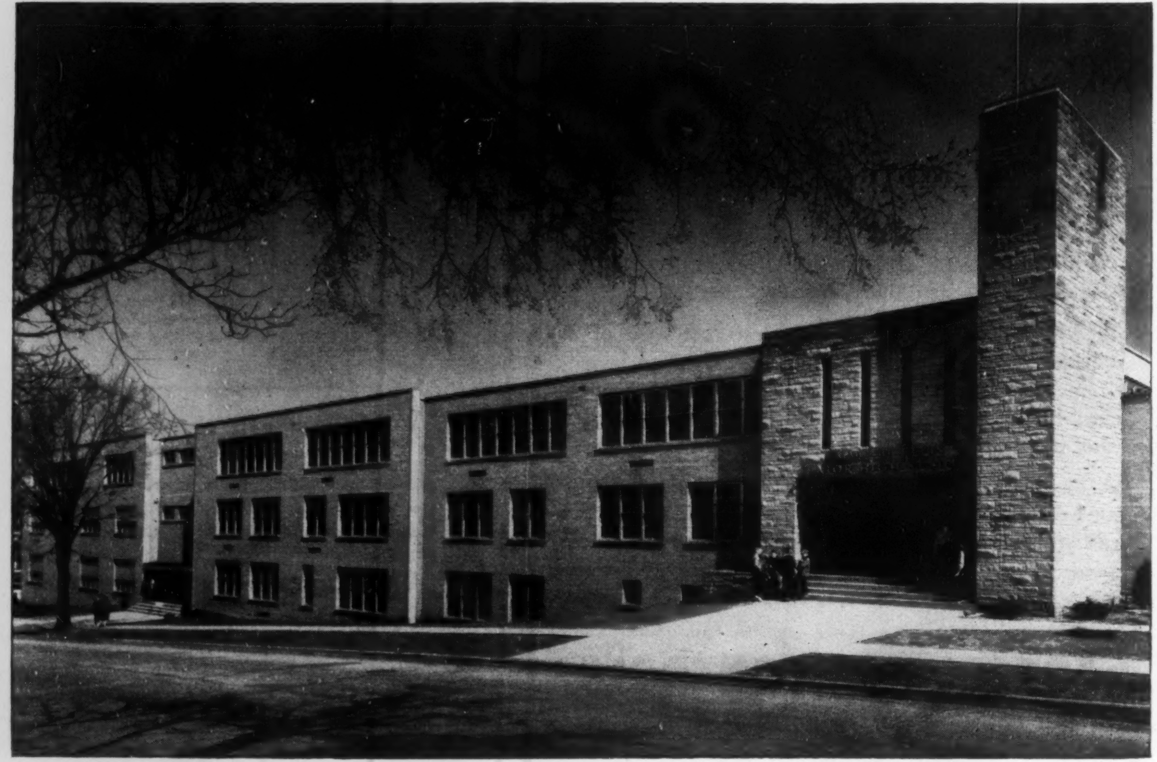
The key word here is "customized." It means that whatever your clients' control requirements, a Honeywell Customized Temperature Control installation *designed to fit the needs of the building and its occupants is your answer.* This applies not only to heating and cooling, ventilating and humidity control but to industrial control as well.

Only Honeywell can provide true "customized" control. Because only Honeywell manufactures all three types of controls—pneumatic, electric and electronic.

The story, in brief form, of the Honeywell Customized Temperature Control installation in the Ellis Junior High School is told here.

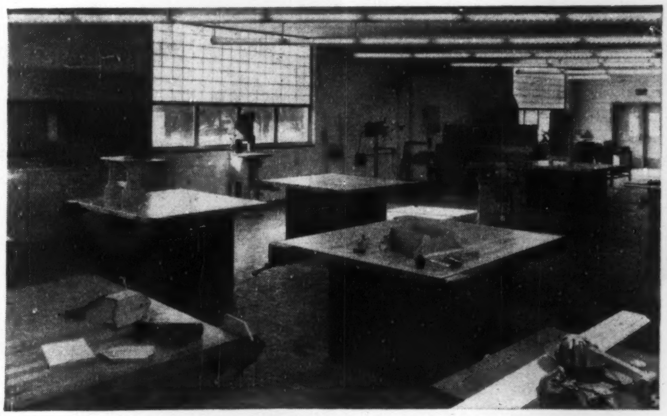
The *techniques* used, applied to your particular problems, can help you give your clients the indoor weather they've always wanted—in any type of building.

The Emmie U. Ellis Junior High School, Elgin, Illinois. Architects and engineers: Elmer Gylleck & Associates; Heating contractor: A. J. Ironside

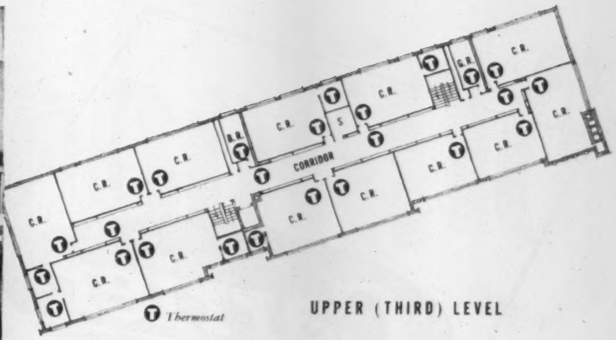


Exposure and occupancy factors are the big control problems in the library. The room has large glass areas facing east which admit a good deal of solar heat on sunny mornings. One minute the library may contain five students, the next – fifty. These problems are easily solved, however, by several Honeywell thermostats placed strategically around the room.

The "use" comfort factor is the biggest problem in the home economics room. When the ranges go on they go on all at once – adding a great amount of extra heat to the room. Ordinarily this would mean real discomfort. But with Honeywell thermostats on the job controlling the heating and ventilating system, home economics students remain comfortable all the time.



Still another "use" problem must be met in the woodworking shop. Students here are physically quite active, need lower room temperatures for comfort. This condition is met handily by the Honeywell Customized Temperature Control installation. Individual thermostats here control space heaters – giving just the right indoor weather for work.



For comfortable, even temperature in new or existing buildings – of any size – specify Honeywell Customized Temperature Control

Whether it's a school, shopping center, factory, office, motel, hospital – or any size building – new or existing, Honeywell Customized Temperature Control can help meet your clients' heating, ventilating, air conditioning and industrial control problems.

Your clients will not only enjoy more comfort and efficiency, they'll save fuel, too.

For full facts on Honeywell Customized Temperature Control, call your local Honeywell office. Or mail the coupon today.

Orrin Thompson, superintendent of schools, Elgin, Ill., says:

"The Ellis school, like most of the schools in Elgin, is a better place to work and learn because it's a comfortable school. Honeywell Customized Temperature Control certainly deserves credit for helping to make it that way."

MINNEAPOLIS
Honeywell
H HONEYWELL *First in Controls*

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water cooling package

- Completely assembled for easy installation
- Compactly designed to save space
- Thoroughly tested and Carrier guaranteed

A ready-made system that's made-to-order for comfort and process applications—that's Carrier's new 75-hp reciprocating water cooling package.

Like the larger 100-hp, 125-hp and 150-hp units, the new 75-hp water cooling unit comes from the factory completely assembled, just as you see it here.

Move it onto the job, set it on its foundation, make the few necessary water and electrical connections, charge it with operating refrigerant—and it's ready for action.

Compact, it fits through a normal-size door. Overall dimensions: 2½ ft. wide, 6 ft. 11 in. high and 13½ ft. long. And because all components are mounted in a vertical supporting frame, the unit occupies a minimum of floor space.

Throughout, there is the careful, exacting, rugged Carrier construction. Even the cooler is fully insulated then metal covered.

Carrier stands behind every water cooling unit — part and parcel. No divided responsibility. Saves time for you. Assures satisfaction for the customer.

Is there more you'd like to know about the Carrier 75-hp water cooling system? Specifications? Availability? Please call your local Carrier dealer, distributor or branch office. They're listed in your Classified Telephone Directory. Or write to: Carrier Corporation, Syracuse, New York.

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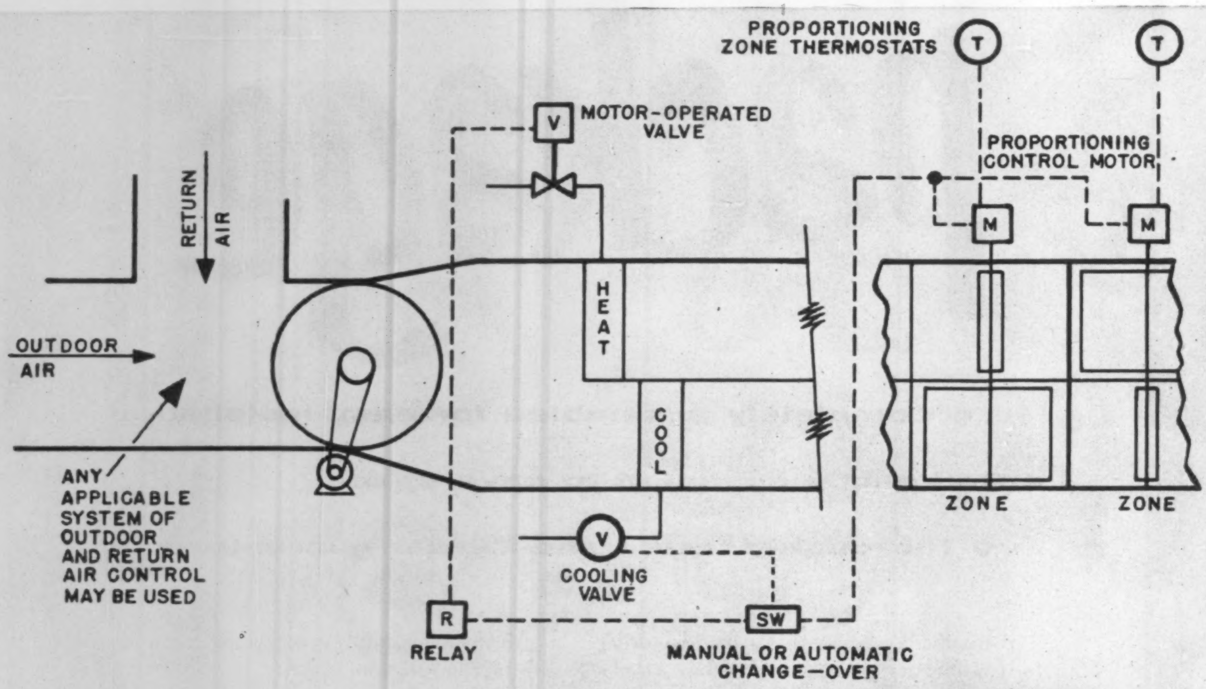
ELECTRIC

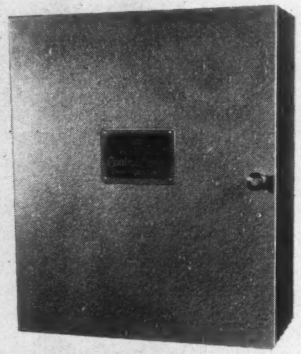
Automatic Controls

...provide low-cost, most effective control of MULTIPLE-ZONE air conditioning systems


PROPORTIONING ZONE THERMOSTATS
T
T
MOTOR-OPERATED VALVE
V
PROPORTIONING CONTROL MOTOR
M
M
RETURN AIR
OUTDOOR AIR
HEAT
COOL
ANY APPLICABLE SYSTEM OF OUTDOOR AND RETURN AIR CONTROL MAY BE USED
ZONE
ZONE
V
COOLING VALVE
R
RELAY
SW
MANUAL OR AUTOMATIC CHANGE—OVER

The modern answer to heating and cooling of commercial and public buildings

Most leading air conditioning equipment manufacturers now have available "packaged" blow-through units to heat and cool one or more zones of commercial and public buildings, or different floors of the same building. Using either hot water or steam, and chilled water or direct expansion coils, the single unit provides comfortable warmth or refreshing cool air in varying degrees to each zone, depending upon the season, internal loads, solar exposure, and requirements of the occupants.

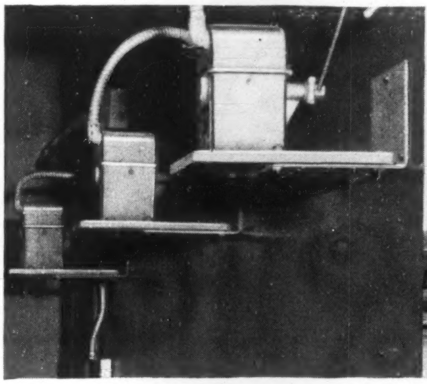


Barber-Colman "Control Centers" serve as central junction boxes, house pre-wired accessories and numbered terminal strips for connecting all electrical components. Wiring is simplified, installation costs decreased, servicing minimized, operation improved.

Utter flexibility of temperature control from one compact unit is the outstanding advantage of multiple-zone, blow-through, fan coil units. Starting with a proportioning thermostat (B-C Microtherm) in each zone to position a proportioning damper motor, the control system can be designed to meet with individual requirements of each installation. A motor-operated valve in the supply line to the heating coil opens and closes as the damper motors are actuated. Or a dual bulb outdoor reset control can be used to vary temperature in the hot deck in accordance with outdoor temperatures.

Supply to cooling coils is similarly controlled by a valve which opens and closes upon demand from the damper motors. The cooling valve can be interlocked with the fan motor to open only when the fan is running.

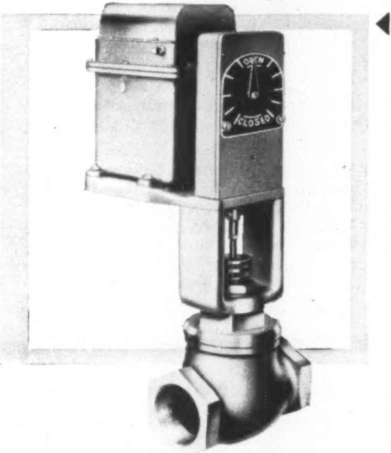
Manually operated, or automatic summer-winter switches contribute to quick change-over of the unit. Any applicable system of outdoor and return air control can be incorporated. With the low-cost, remarkable flexibility of electrical controls . . . and with the guidance of nearby Barber-Colman application engineers in laying out systems . . . the multiple-zone air conditioning system provides economical, practical, year 'round comfort.



Barber-Colman Control Motors, "standard of the industry," operate dampers on 3-zone, blow-through heating and cooling unit. Oil-submerged mechanism lasts for decades. Proportioning-type.

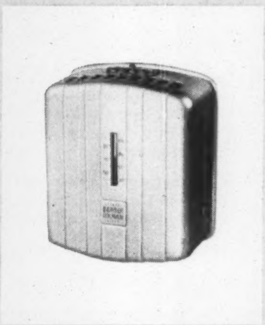
IBM
INTERNATIONAL BUSINESS MACHINES

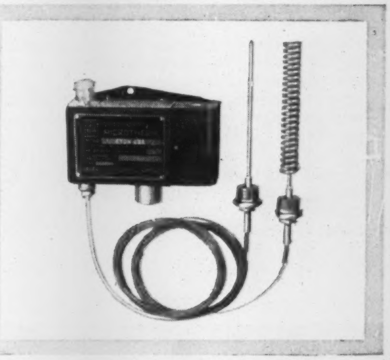
International Business Machines Building, Grand and Lindell, St. Louis, has Trane 3-zone Climate Changer operated by Barber-Colman Automatic Controls, complete with "Control Center." Building houses branches of IBM and Great Lakes Carbon Co. Heating and air conditioning contractor was John C. Murphy Company.



◀ **(Left) Motor-Operated Valves** provide control of steam, hot water, or chilled water.

(Right) Room Microtherm provides proportioning control of heating and cooling system, summer and winter. Accurate, reliable, with handsome champagne gold-finished cover. ▶





Dual Bulb Outdoor Reset Control varies air temperatures in hot deck in accordance with outdoor temperature changes

NEW LITERATURE KIT!

Based upon research and experience with multiple-zone systems, Barber-Colman has assembled a kit of literature visualizing several types of automatic electric control systems. Write for your kit, or call your nearby Field Office (consult telephone directory) for help on your problem.

BARBER COLMAN

ELECTRIC

Automatic Controls

BARBER-COLMAN COMPANY, ROCKFORD, ILLINOIS

Automatic Controls • Air Distribution Products • Industrial Instruments Aircraft Controls • Small Motors • OVERdoors and Operators • Molded Products • Metal Cutting Tools • Machine Tools • Textile Machinery

BARBER-COLMAN COMPANY, Dept. F, 1301 Rock St., Rockford, Ill.

☐ Please send free Kit on Automatic Electric Controls for Multiple-Zone Air Conditioning Systems.

Name________________________

Firm Name________________________

Address________________________

City____________ State____________

Get these 18 advantages in 1

Trane Self-Contained Units now up to

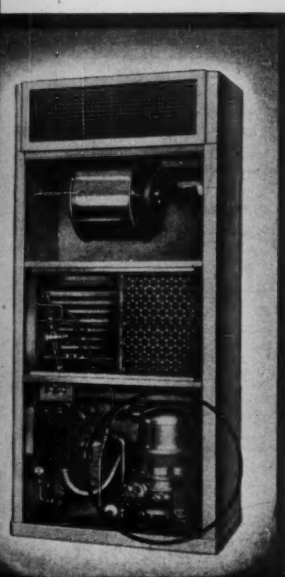
Trane Units, with the industry's most advanced compressors, give better performance . . . lower operating cost

Give customers greater comfort for lower operating cost . . . longer life for less maintenance with TRANE Self-Contained Air Conditioners. New accessible hermetic compressors in 3, 5 and 7½ ton models. Compressors in all models are newest, most advanced design in the industry. All internal wiring and refrigerant piping is done at the factory . . . saves time, saves installation cost. Built-in evaporative condenser is optional on the 10, 15 and 20 ton sizes.

For complete information, call your nearest TRANE Sales office, or write TRANE, La Crosse, Wisconsin.

Check These Features of Trane 10, 15 and 20 Ton Units

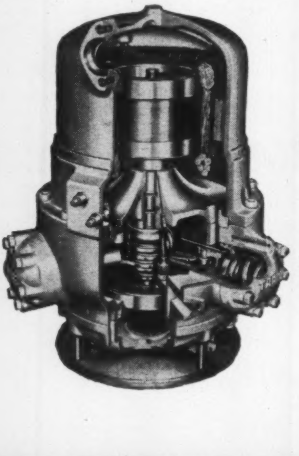
1. **High speed, smooth running compressor** has 85% volumetric efficiency at normal operating conditions.
2. **Multi-step unloaders save power** automatically as load is reduced. Boosts compressor life, cuts cycling.
3. **Exclusive! Valves last 800% longer** than ordinary steel valves. Ring type valves are cadmium plated. Only TRANE compressors have this feature.
4. **Direct drive cuts power costs 5%!** Eliminates power-wasting belt drives, reduces maintenance.
5. **Simplified maintenance!** Minimum number of bolts and gaskets. Major parts are complete sub-assemblies. Cylinder liners are easily removable. All major moving parts are interchangeable between 10, 15 and 20 ton sizes.
6. **Forced lubrication!** Reversible oil pump has three times needed capacity. Oil is twice filtered—passes over three magnetic plugs.
7. **Extra safety!** Spring-loaded safety heads prevent liquid slug damage. Oil pressure failure protection switch provided.
8. **Quiet operation!** All rotating parts dynamically and statically balanced. Compressor-motor unit mounted on vibration isolators. Vibration eliminated from frame.
9. **Liquid-to-suction heat exchanger** is standard equipment. Boosts efficiency of compressor and evaporator, protects against liquid slugging.
10. **Complete control panel standard equipment.** All controls fully wired, cuts installation cost. Refrigeration, starting and operating controls for entire unit are provided.
11. **Serviceman's dream!** All major parts easily accessible from front of unit. Cam-lock panel quickly removable. Clean-cut factory assembly simplifies maintenance.
12. **More rugged construction!** Heavy-duty frame is made of full ¼" angle iron for added strength and rigidity.
13. **Motor noise insulated from air stream!** Insulated panel separates motor section from air handling section. All other panels are insulated with ½" of glass wool.
14. **TRANE Fans have high efficiency,** low bhp requirement.
15. **Water pump located outside moist air stream** for maximum protection—longer life.
16. **Power costs cut!** Large orifices on spray nozzles provide greater flow, cut pump power cost, reduce scaling and maintenance.
17. **Complete set of liquid line controls** provided as standard equipment.
18. **Saves up to 95% water consumption,** more on days of high humidity. Condensate from evaporator coil in conditioner section is piped to condenser water tank . . . cuts make-up water costs.



New Accessible Hermetic Compressor in 3, 5, 7½ Ton Units

Easier to service . . . more efficient performance

- **Less vibration.** Vibration displacement in mils: Horizontal, 0.5; vertical 0.2 and radial, 1.0!
- **Accessible hermetic design**—bolted construction permits servicing. Motor and compressor completely sealed—no shaft seal to leak costly Freon. Suction strainers and valves easy to get at. Lube oil can be drained through exterior plug.
- **Exclusive reversible oil pump has no wearing parts!** Lasts a lifetime, gives positive pressure instantly on start-up.
- **Exclusive lifetime valves!** Cadmium plated valves last up to 800% longer than ordinary valves!



- **Major servicing is easier!** Minimum number of internal bolts and gaskets speed servicing. Replaceable cylinder liner saves reboring. Liner and valves easily reached through removable spring-loaded safety head.
- **Motor can't be damaged by water failure!** It's cooled by the suction gas instead. Cylinder liners also gas cooled.
- **Self-contained cabinet has modern design** for installation in conditioned space. Gray crackle finish, rounded corners, heavy furniture steel casing, fully sound insulated.

compact air conditioner . . .

20-ton capacity!

14
13
10
9
11
3
6
2
1
7
5
4
17
12
16
8
15
18

TRANE Self-Contained Air Conditioners. 10, 15 and 20 ton capacity with built-in evaporative condenser optional.

one source • one responsibility

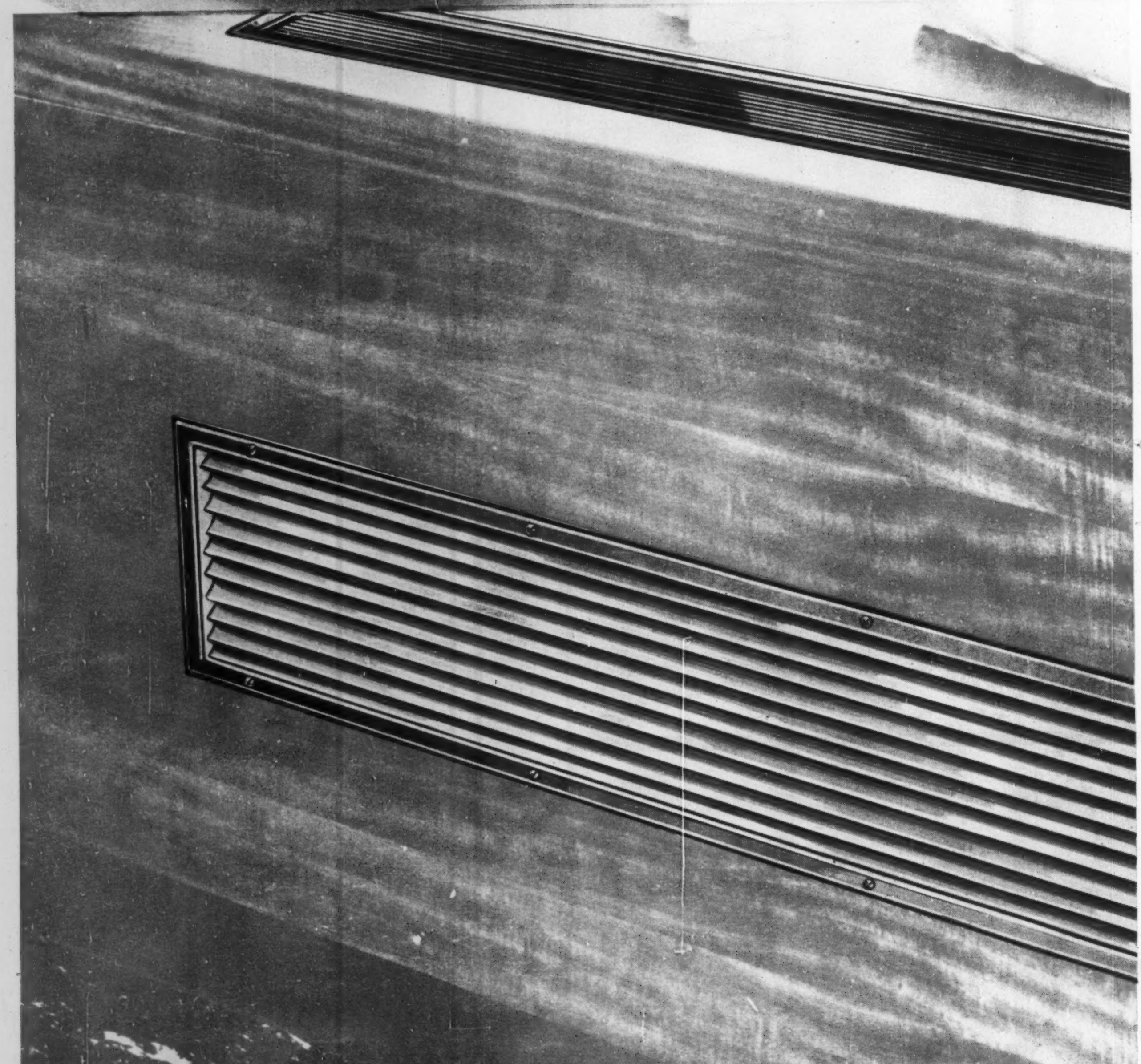
TRANE

Self-Contained Air Conditioners bring you the most advanced compressors in the industry!

MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

The Trane Company, La Crosse, Wis. • East. Mfg. Div., Scranton, Penn. • Trane Co. of Canada, Ltd., Toronto
90 U. S. and 14 Canadian Offices

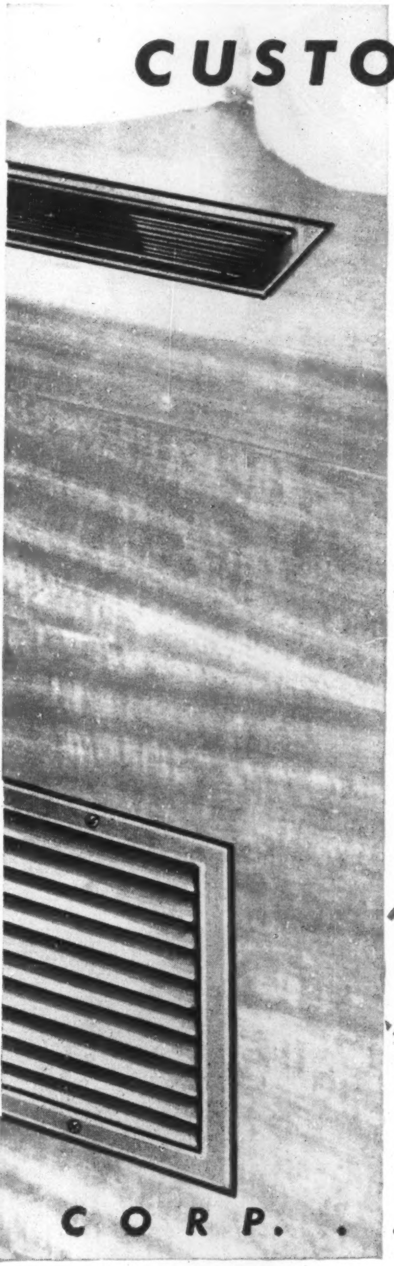
TITUS *New*


TITUS MANUFACTURING

Convector Grille*

CUSTOM DESIGN FREEDOM

Without Additional Building Cost



Made with a "decorator's touch"... *to add beauty to any installation.* Built above and beyond average demand for performance that's above and beyond average. Cost is kept at standard price level.

EXTRA RUGGED • WILL WITHSTAND HEAVIEST USE AND ABUSE • TAMPER PROOF • NO "SEE THRU" • HEAVY DUTY SUPPORT BARS ON 6" CENTERS • MADE TO ANY SIZE • OVER 70% FREE AREA • INSTALL IN MARBLE, TILE OR ANY SPECIAL SURFACE • EXTRA WIDE BLADES ... HEMMED FOR ADDED STRENGTH • AVAILABLE WITH DAMPER FOR VOLUME CONTROL OR SHUTOFF

Free Catalog

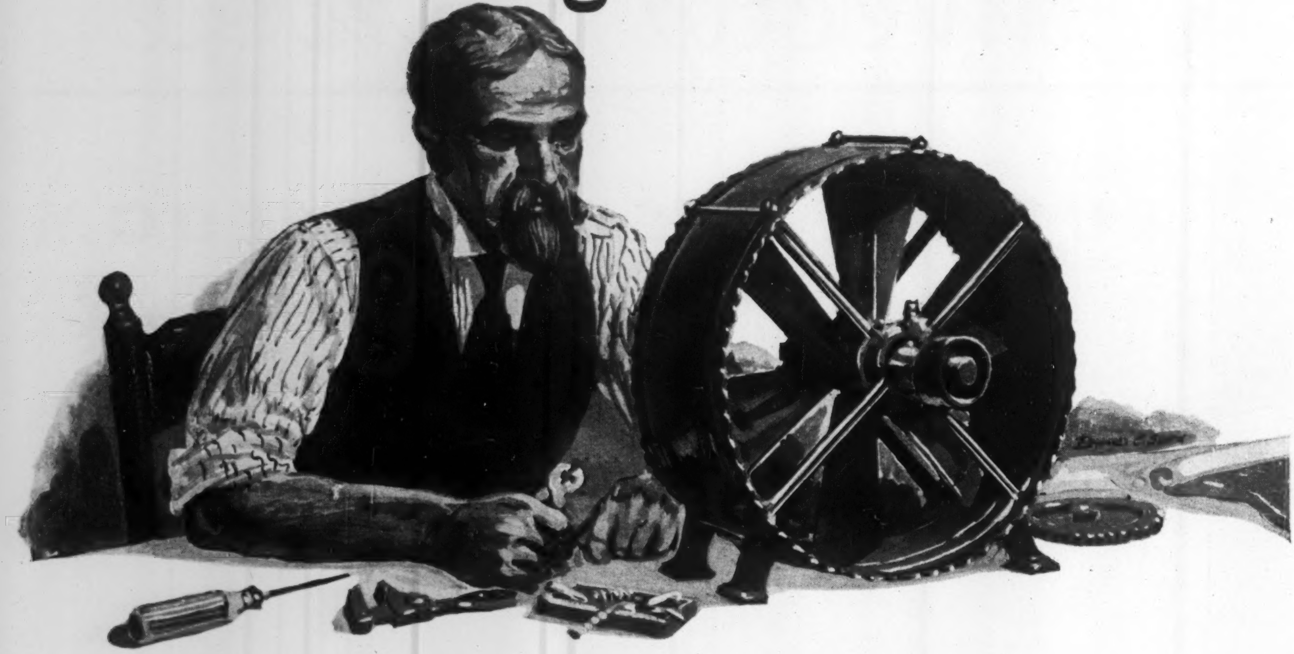
TITUS Airfoil Grilles offer features which dollar for dollar cannot be duplicated. Get the complete facts on these famous units. Write today.

FACTS ON
CONSTRUCTION
PERFORMANCE
SELECTION
SPECIFICATION
Air-foil

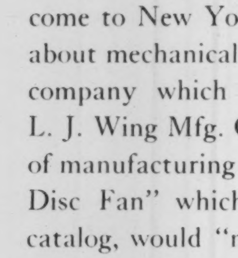
*Available also in famous Titus Extruded Aluminum models. Refer April, 1954 Issue Architectural Record.

CORP. . . . WATERLOO, IOWA

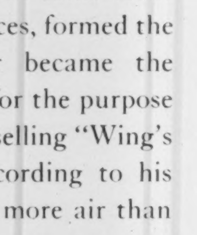
In 1879, it was the new "Wing's Disc Fan"



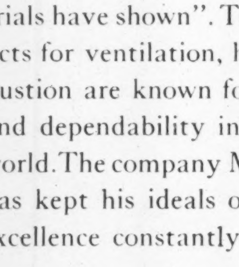
It was 75 years ago that L. J. Wing, an ingenious Yankee who had come to New York with some ideas about mechanical devices, formed the company which later became the L. J. Wing Mfg. Co., for the purpose of manufacturing and selling "Wing's Disc Fan" which, according to his catalog, would "move more air than any other Fan made for heating, ventilation, drying, etc., as competitive trials have shown". Today, Wing products for ventilation, heating and combustion are known for their efficiency and dependability in all parts of the world. The company Mr. Wing founded has kept his ideals of originality and excellence constantly before them.



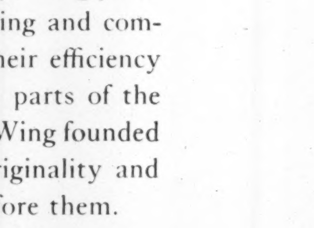
REVOLVING UNIT HEATER



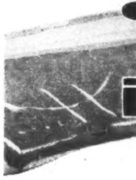
UTILITY UNIT HEATER



STRAIGHT LINE DUCT FAN



ELBOW DUCT FAN



today, Wing Fans, Blowers, Unit Heaters, Draft Inducers and Turbines are serving industry the world over

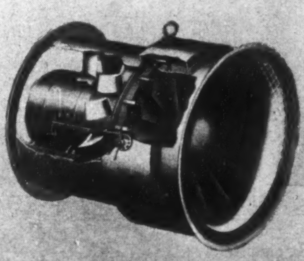
OUR 75TH 1879-1954 YEAR

L. J. Wing Mfg. Co.

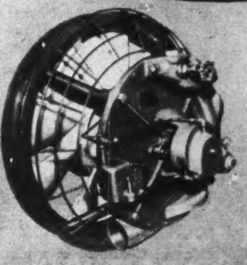
Linden • New Jersey

FACTORIES:
LINDEN, N.J.
&
MONTREAL
CANADA

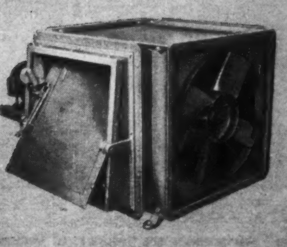
OFFICES IN
• PRINCIPAL CITIES •
EUROPEAN REPRESENTATIVE
FOR HEATERS:
ETABLISSEMENT WANSON
BRUSSELS • BELGIUM



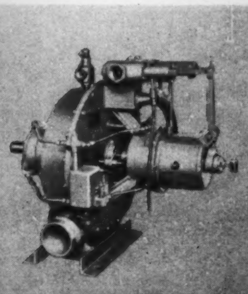
MOTOR DRIVEN BLOWER



TURBINE BLOWER

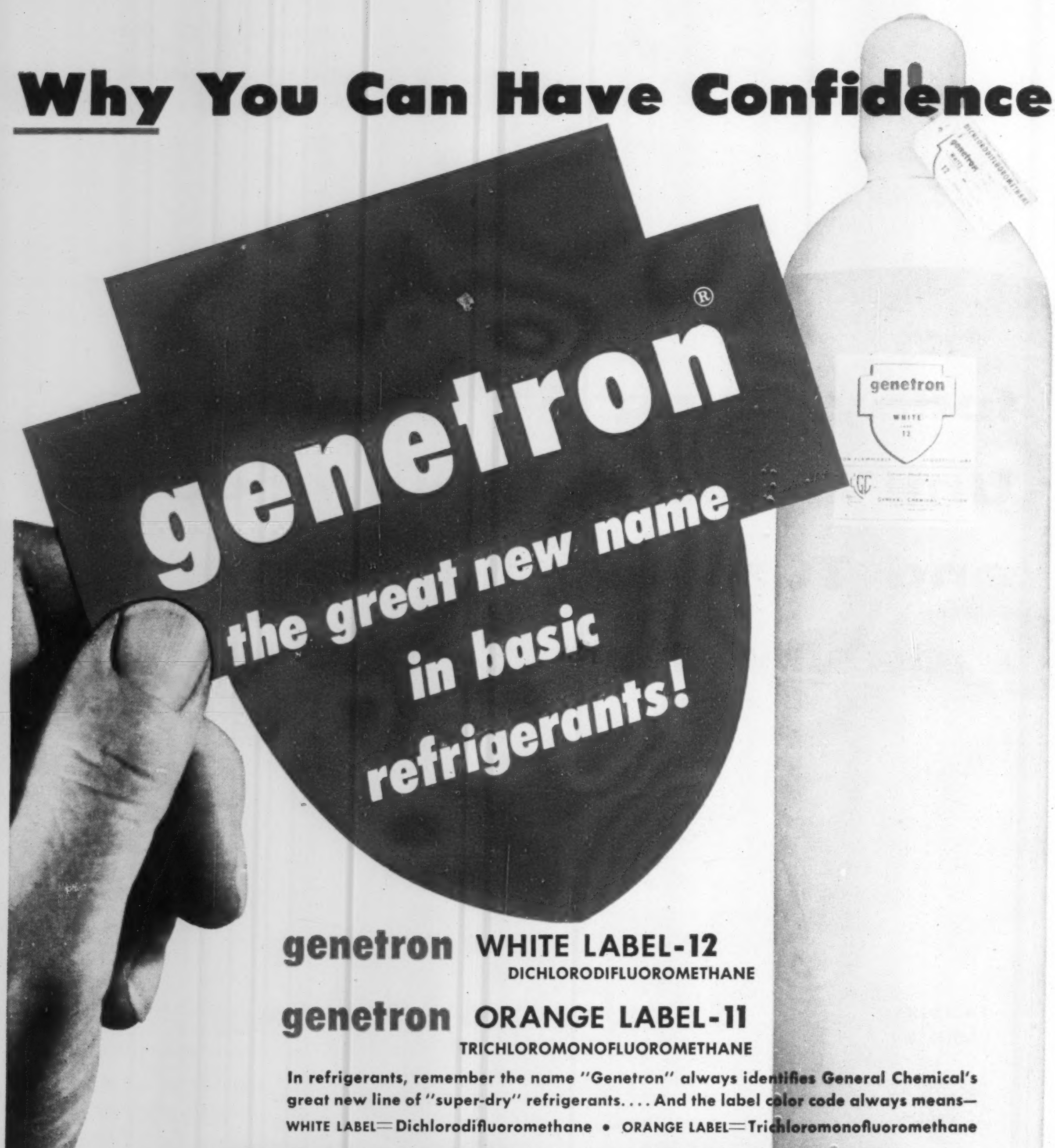


DRAFT INDUCER



TURBINE

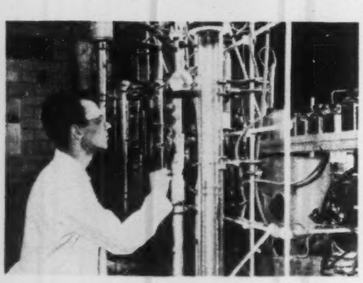
Why You Can Have Confidence



genetron WHITE LABEL-12
DICHLORODIFLUOROMETHANE

genetron ORANGE LABEL-11
TRICHLOROMONOFLUOROMETHANE

In refrigerants, remember the name "Genetron" always identifies General Chemical's great new line of "super-dry" refrigerants.... And the label color code always means—
WHITE LABEL=Dichlorodifluoromethane • ORANGE LABEL=Trichloromonofluoromethane



EXTENSIVE RESEARCH

"Genetron" refrigerants are products of General Chemical's extensive, continuous fluorine research program which has produced over 90 fluorine products for science and industry.

SOUND BASIC POSITION

General Chemical is a pioneer and pace-setting leader in the field of fluorine chemicals. Its position is basic and sound—including mines and reserves for necessary raw materials.

when you see this label...

Any time you buy a product from a new source, you naturally want to know more about the manufacturer to make sure he and his products are dependable. That's only smart business . . . and it's certainly doubly important when the product is as basic and vital as the refrigerants you use.

What about General Chemical—the maker of "Genetron" refrigerants?

Serving Behind the Scenes in Your Daily Life

Just this—the steel in your family automobile and refrigerator was quite likely processed with General Chemical's sulfuric acid . . . the water you drink may well have been purified with General's "Alum", just as the clothes you wear and the food you eat probably have been produced with the help of one or a dozen other "G.C." products.

"Basic Chemicals for American Industry"

In other words, General Chemical is one of America's greatest producers of basic industrial and agricultural chemicals . . . and has been since 1899. It supplies every major industry that uses chemicals . . . from petroleum to pharmaceuticals . . . and has served a good part of its customers since they first opened their doors. Its slogan—*Basic Chemicals for American Industry*—typifies the scope and depth of its services.

Backs its Products All The Way

Now—with its large-scale production of "Genetron" organic flourine refrigerants, General Chemical is serving the air conditioning and refrigeration industry in the same sound, steady manner that has earned it the confidence of thousands of customers in so many other fields.

So, whenever you see the "Genetron" label on a refrigerant cylinder or drum—remember that General Chemical is the company behind this great new name in basic refrigerants . . . *and it backs them all the way!*

Available in all standard container sizes:

Genetron WHITE LABEL-12 is shipped in 10-lb., 25-lb., 145-lb., and one-ton (2,000 lbs.) cylinders.

Genetron ORANGE LABEL-11 is shipped in 100-lb., 200-lb. drums, and one-ton (2,000 lbs.) cylinders.

FOR FURTHER INFORMATION . . .

Write or 'phone the nearest General Chemical office listed below. Ask for FREE TECHNICAL SERVICE BULLETIN 11.12A on "Genetron" Refrigerants

Products of

GENERAL CHEMICAL DIVISION

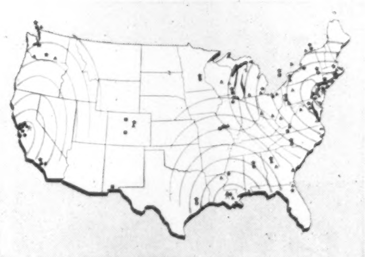
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

Offices: Albany • Atlanta • Baltimore • Birmingham • Boston • Bridgeport • Buffalo Charlotte • Chicago • Cleveland • Denver • Detroit • Greenville (Miss.) • Houston Jacksonville • Kalamazoo • Los Angeles • Minneapolis • New York • Philadelphia Pittsburgh • Providence • San Francisco • Seattle • St. Louis • Yakima (Wash.)
In Wisconsin: General Chemical Company, Inc., Milwaukee

In Canada: The Nichols Chemical Company, Limited • Montreal • Toronto • Vancouver

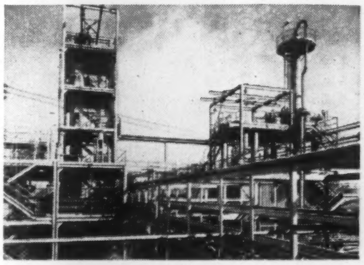
GC
Allied Chemical
REG. U.S. PAT. OFF.

America's Foremost Producer of Fluorine Chemicals



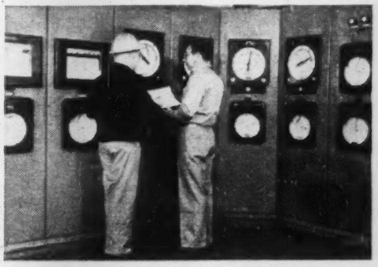
NATION-WIDE SERVICE

General Chemical has almost 100 service and supply points throughout the United States and Canada. Production centers for fluorine chemicals are indicated by stars.



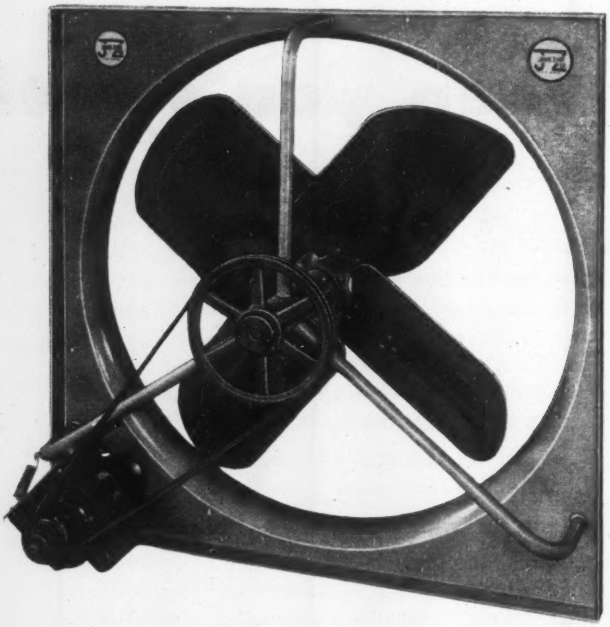
SUPERIOR FACILITIES

General Chemical's "Genetron" plant at Baton Rouge, Louisiana, is one of the most modern fluorine refrigerant plants in America, employing special new manufacturing processes.



EXACTING PROCESS CONTROL

The extremely low moisture content and high purity of "Genetron" refrigerants is a result of advanced manufacturing methods and unique process control techniques.



JOHN ZINK

Venturi-Type
V-Belt Driven

INDUSTRIAL EXHAUST FANS

For: **FACTORIES, FOUNDRIES, LAUNDRIES, GARAGES, MINES, MILLS, and OTHER INDUSTRIES.**

Features: **Welded Steel Frame • Balanced Propeller • Balanced Pulley • V Belt Drive • Rubber Mounted Bearings — sealed for life • Automatic Belt Tightener • Streamlined Orifice for Maximum Efficiency • Ball Bearing Motor • Life Time Lubrication**

AND are designed for VERTICAL or HORIZONTAL installation

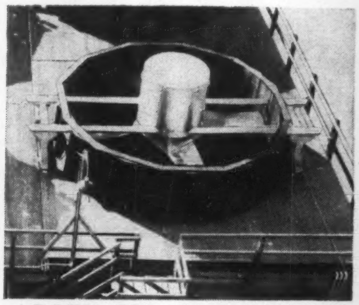
SIZES:

Propeller Size	24″	30″	36″	42″	48″
Motor Size	1/3 h.p.	1/3 h.p.	½ h.p.	¾ h.p.	¾ h.p.
Propeller R.P.M.	620	530	450	390	300
C.F.M.	5,250	8,400	12,000	16,000	18,000

Write for Illustrated Literature

JOHN ZINK COMPANY

4401 South Peoria
Tulsa 5, Oklahoma



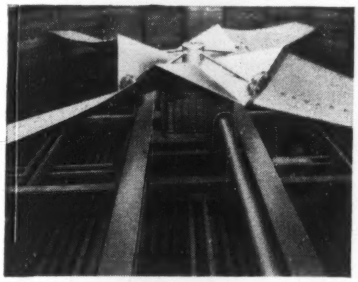
PATENTED FAN DRIVES
Self-ventilated, fully encased, completely integrated assembly.

WHY ?

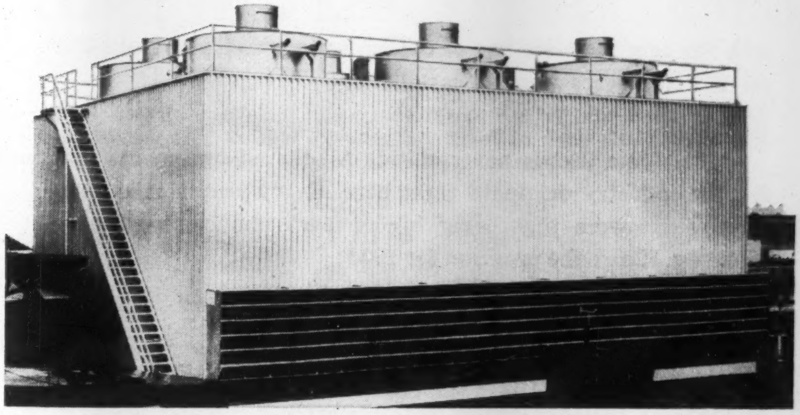
Why do hundreds of critical engineers and contractors choose Pritchard to help them solve their comfort cooling problems?

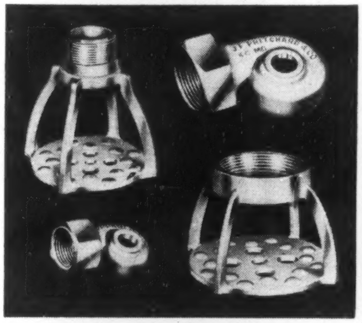
Right now, you probably don't have time to read all the reasons, so we've just pictured several of them for you. But, next time you want the right tower for a specific cooling job, contact Pritchard and find out the rest of the reasons why.

Your Pritchard representative is listed in the classified section of the telephone directory, or you can write direct to the address given below.

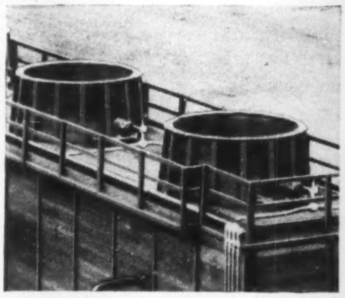


EXCLUSIVE FANS
Designed especially for cooling tower service, low horsepower requirements. Right angle worm gear drive shown here.





MORE EFFICIENT DISTRIBUTORS
Patented low-pressure design for better spray, more efficient cooling.



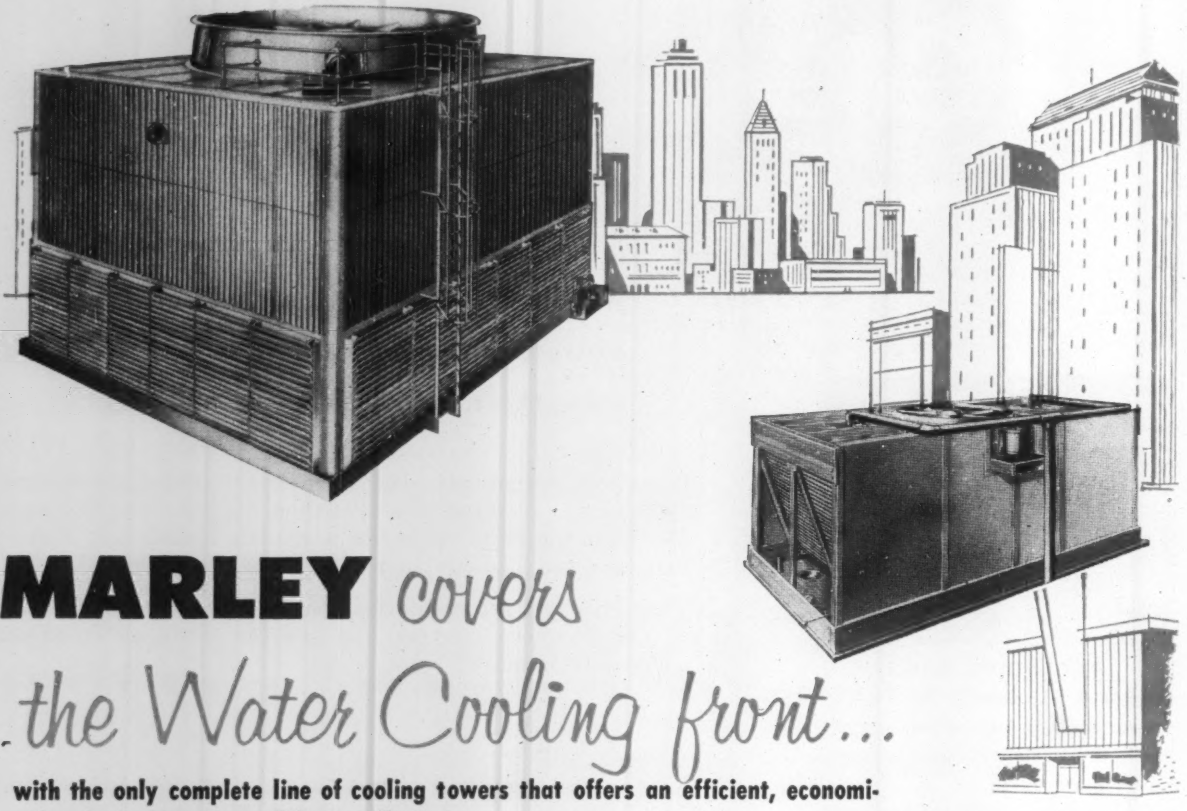
SUPERIOR FAN THROATS
All redwood unitized design, modified Venturi throat permits close blade tolerances, assures highest efficiency.

Industry's Partner for Progress

J. F. Pritchard Co.
OF CALIFORNIA
A DIVISION OF J. F. PRITCHARD & CO.
Dept. 410, 210 West 10th St., Kansas City 5, Mo.

COOLING TOWERS
SPECIALIZED HEAT EXCHANGERS
GAS & AIR TREATING EQUIPMENT

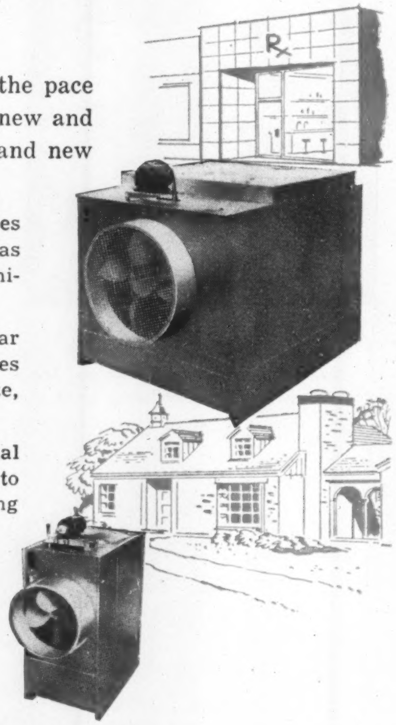
Representatives in Principal Cities from Coast to Coast



MARLEY *covers the Water Cooling front...*

with the only complete line of cooling towers that offers an efficient, economical unit for every possible installation

It's a line that is never static. All the advancements that set the pace for the industry originate right here. Every year Marley presents new and improved towers that bring higher performance, added capacity and new economy. Here's the program for 1954:



NEW CS (COUNTERFLOW STEEL) SERIES . . . for 250 tons capacities and upwards. Here is a completely new design tower for metropolitan areas with rigid fire codes. It is ultra-flexible for location and engineered to eliminate expensive hoisting and erection costs.

MODEL 12 DOUBLE-FLOW AQUATOWER . . . adapts the most popular intermediate capacity cooling tower to larger capacity services. It enhances all the desirable features of this tower . . . high performance low silhouette, excellent weight distribution and simple piping.

MARLEY AQUATOWERS . . . another size has been added to this original line of "packaged" units. All models have been improved to bring to the 2 to 60 ton range even better performance and greater installation and operating economies.

For complete information on these new and improved Marley cooling towers, get in touch with your local Marley man today.

MARLEY

The Marley Company Kansas City, Mo.

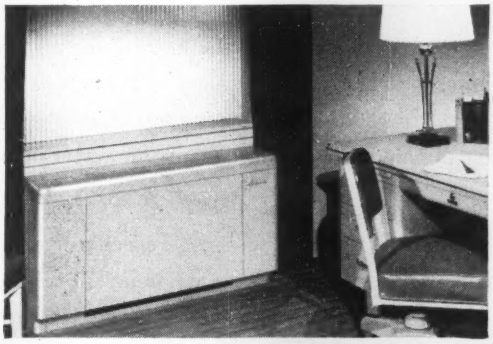
FOR COOLING · HEATING · VENTILATING...

new Modine AIRditioner outpoints them all!

FEATURE	MODINE AIRDITIONER †	CONDITIONER A	CONDITIONER B	CONDITIONER C	CONDITIONER D
Available in 5 types? (Console, concealed, 3 overhead models — finished case, utility cased, unencased)	YES	NO	NO	NO	NO
Number of fan speeds	4	3	3	2	2
Can end panels be removed to facilitate piping?	YES	YES	NO	YES	NO
Is ample space provided for piping?	YES	YES	NO	YES	NO
Is coil easily reversible for right or left-hand piping?	YES	NO	NO	YES	NO
Does design prevent condensate from dripping into fan casing?	YES	NO	NO	YES	YES
Is coil protected from objects dropped thru upper grille?	YES	NO	NO	YES	YES
Are motors lifetime lubricated?	YES	YES	NO	NO	YES
Can power assembly be easily removed?	YES	NO	NO	YES	YES
Is internal wiring done at the factory?	YES	YES	NO	YES	YES
Is front small and easy to remove?	YES	NO	NO	NO	NO
Is offset for toe space provided?	YES	NO	YES	YES	NO
Are two access doors provided?	YES	NO	NO	NO	NO
Are corners square for ease of recessing?	YES	NO	NO	NO	YES
Projection into room when recessed to full depth	6"	Not recessable	7½"	8½"	6"

† Trademark

THE QUALITY CHART TELLS THE STORY. Only Modine AIRditioners have all the extra quality features that mean superior cooling and heating . . . longer life . . . quieter operation. For all the facts, see the Modine representative listed in your classified phone book or mail the handy coupon below . . . today!

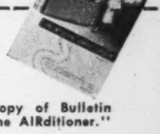


LOOK! AIRditioner is styled by Jean Otis Reinecke, leading industrial designer. Attractive marine green primer is often used as finish coat. Console model is shown recessed.

LISTEN! You can enter a room in which an AIRditioner is running and hardly be able to tell it is operating. Quiet operation certified by decibel ratings.

IT COOLS
IT HEATS
IT VENTILATES

Modine AIRditioner



MODINE MFG. CO.
1509 DeKoven Ave.,
Racine, Wisconsin

Please send me a free copy of Bulletin describing "The New Modine AIRditioner."

Name ....

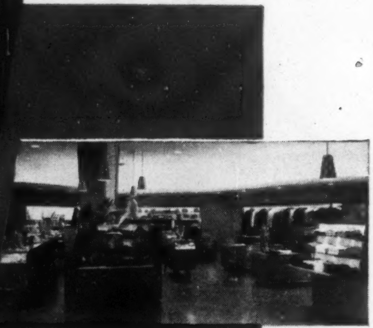
Position ....

Firm ....

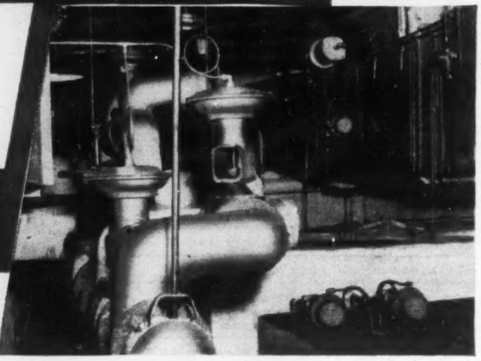
Address ....

City .... Zn .... State ....

A-1225



For all-weather comfort
FINE STORES depend on
JOHNSON CONTROL



Lytton's, Henry C. Lytton & Co., Evanston, Illinois. Shaw, Metz and Dolio, architects and engineers, Chicago; Wanzenberg Heating Co., heating contractors, Evanston.

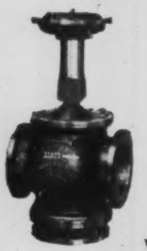
Johnson Steam Valve (in center), positioned by T-800 Thermostat (not shown), controls steam supply to reheat coil. Johnson Damper Operators control the zone mixing dampers.

**T-800
Remote Bulb
Thermostat**

**V-103
Coil Valve**

**D-251
Piston Damper
Operator**

**T-400
Room
Thermostat**



**V-108
Three-way
Mixing Valve**

Henry C. Lytton's modern store in Evanston, Illinois, like so many of the nation's fine stores, depends on Johnson Control for all-weather comfort.

With Johnson Control in command, the heating and air conditioning systems are under complete and precise control at all times to insure the ultimate in shopping comfort. In addition, Johnson controlled snow melting equipment keeps walks free of snow and ice throughout the winter months.

The accuracy and flexibility enjoyed at Lytton's Evanston store are typical of Johnson Control Systems, because each one is specifically designed *and installed* by Johnson to meet the needs of the individual control problem. That is why you will find Johnson *Planned-for-the-Purpose, Installed-for-the-Purpose* Control, not only in leading stores, but in every type of public, commercial and industrial building.

The nearly 70 years of experience of the nationwide Johnson organization is at your disposal without obligation. Why not let a Johnson engineer from a nearby branch office solve your temperature control problems? JOHNSON SERVICE COMPANY, Milwaukee 2, Wisconsin. Direct Branch Offices in Principal Cities.

JOHNSON *Automatic Temperature and Air Conditioning* **CONTROL**

MANUFACTURING · PLANNING · INSTALLING · SINCE 1885

FLOW
THRUSH FLOW
CONTROL VALVE
PAT. RE. NO. 19873
TO TANK
OPEN
NORMAL

when you MODERNIZE old radiator heating plants be sure to add THRUSH forced circulation

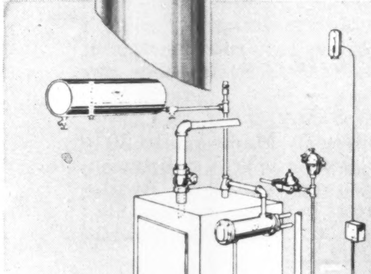
Thrush Flow Control Valve with Air Tube eliminates air

Steam, vapor or old hot water heating plants all can be easily converted to efficient, modern forced circulating hot water heating with low-cost Thrush equipment.

Why add automatic firing unless you go the rest of the way? Make sure your customer will enjoy really uniform, economical heating with Thrush System. It makes any job heat better with lower fuel cost. There is no noticeable variation in room temperature in any weather. Plenty of hot water for kitchen, laundry and bath is provided by the same heating boiler, winter and summer.

HOT WATER HEAT IS BEST

See your wholesaler today for more information about modernizing old heating plants with Thrush System or write Dept. E-6.



Complete Thrush Flow Control System

Thrush Water Circulator provides positive circulation

H. A. THRUSH & COMPANY

PERU, INDIANA

"You see POWELL VALVES everywhere!"

Naturally! Since Powell makes more kinds of valves—and has probably solved more valve problems—than any other organization in the world. And Powell Valves have a record of dependable flow control since 1846.

Just name the kind of precision valve you need—Powell can supply it. Made ⅛" to 30" and 125 pounds to 2500 pounds W.S.P. Bronze, iron, steel and corrosion resistant alloys. Available through distributors in principal cities. On problems, write direct to The Wm. Powell Company, Cincinnati 22, Ohio.

CONTROLS FOR THE LIFE LINES OF INDUSTRY

Powell Valves

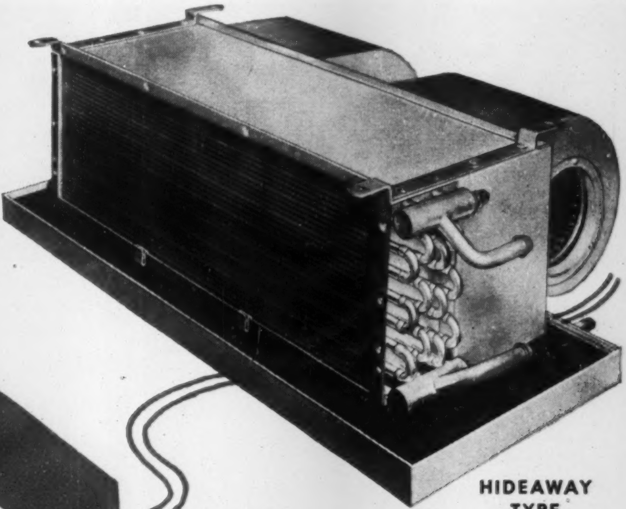
108th year

REMOTE
ROOM AIR CONDITIONERS

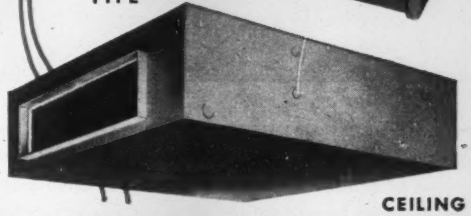
for existing buildings or new construction

McQuay SEASONMAKERS

for use with chilled water or freon systems


HIDEAWAY TYPE

FLOOR TYPE


CEILING TYPE

BASIC TYPE

For hotels, tourist courts, apartment houses, office buildings, hospitals or residences—new or old construction, the famous family of McQuay Seasonmakers gives you widest flexibility in planning individual room air conditioning.

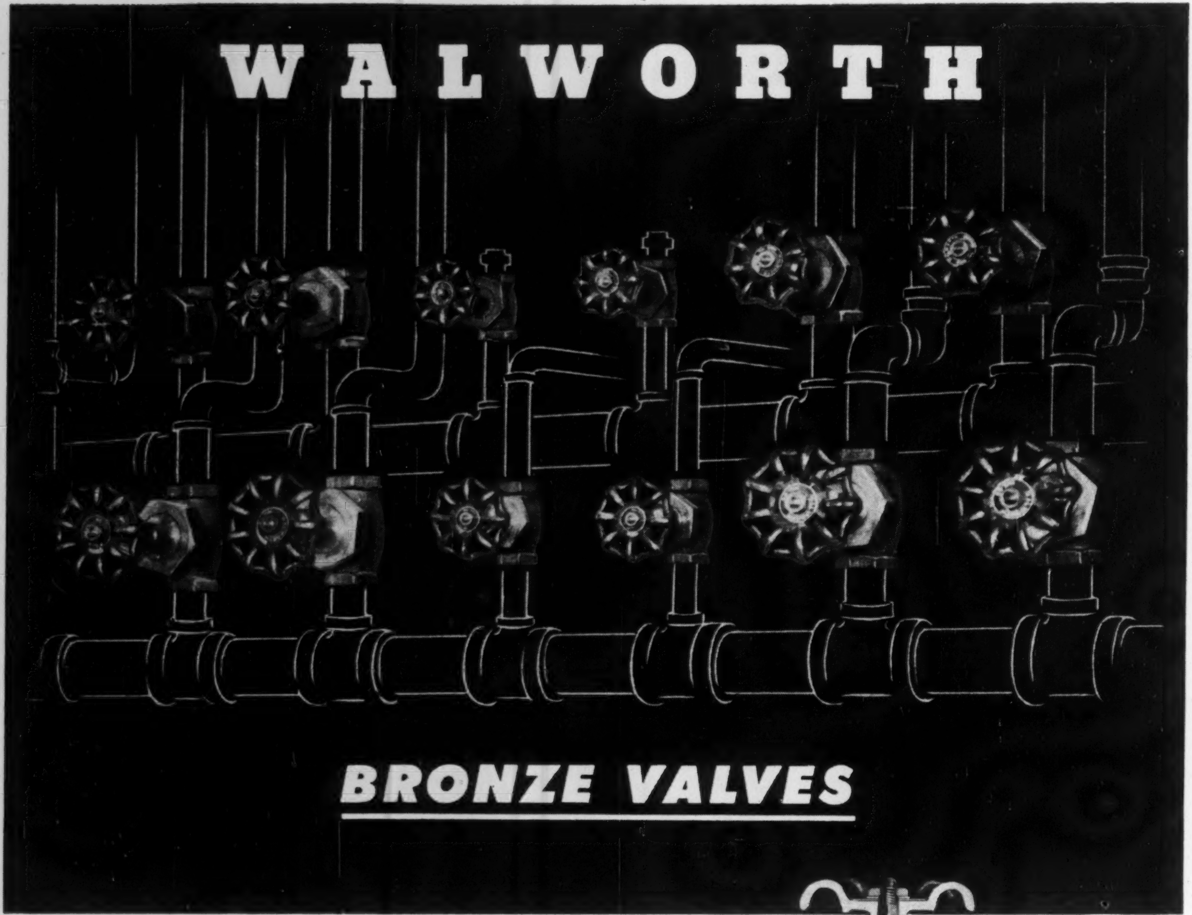
The popular HIDEAWAY, newest member of the Seasonmaker family, meets the requirement for a unit especially designed for concealed mounting, in furred ceilings, closets, vestibules and wherever space is at a premium. Available also in Floor type, for free standing mounting; Basic type, for fully recessed wall installations; and Ceiling type, for suspended mounting. The four types in three different sizes, 200, 400 and 600 CFM, simplify selection of the right unit for the job.

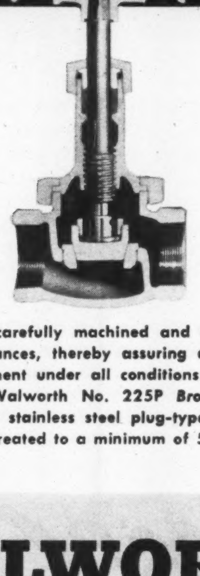
Exclusive Ripple-Fin coil construction assures long life and dependable service. All Seasonmakers are designed for quiet operation and for easy installation and maintenance. Get complete details on features and specifications in Bulletin 703. Representatives in principal cities or write McQuay Inc., 1601 Broadway N.E., Minneapolis 13, Minnesota.

McQuay INC.

MAKE THE SEASONS COME TO YOU

★ AIR CONDITIONING ★ REFRIGERATION ★ HEATING





Better because ... **Walworth has standardized its line of bronze valves to provide an unsurpassed system of interchangeability of parts for assembly or replacement. You can maintain a great number of Walworth Bronze Valves with a small inventory of basic parts . . . you minimize part replacement problems. For further information, ask us for our Bronze Valve Standardization Chart.**

Parts are carefully machined and finished to close tolerances, thereby assuring accurate fit and alignment under all conditions. Sectioned valve is Walworth No. 225P *Bronze Globe Valve* with stainless steel plug-type seat and disc, heat-treated to a minimum of 500 Brinell hardness.

Choose from complete lines of Walworth Bronze Valves – including gate, globe, angle, check, and lubricated plug types. Walseal® Bronze Valves and Fittings are also available for making silver-brazed joints.

For full information on Walworth Bronze Valves and Fittings, call your Walworth Distributor, nearest Walworth Sales Office, or write to Walworth Company, General Offices, 60 East 42nd Street, New York 17, N. Y.

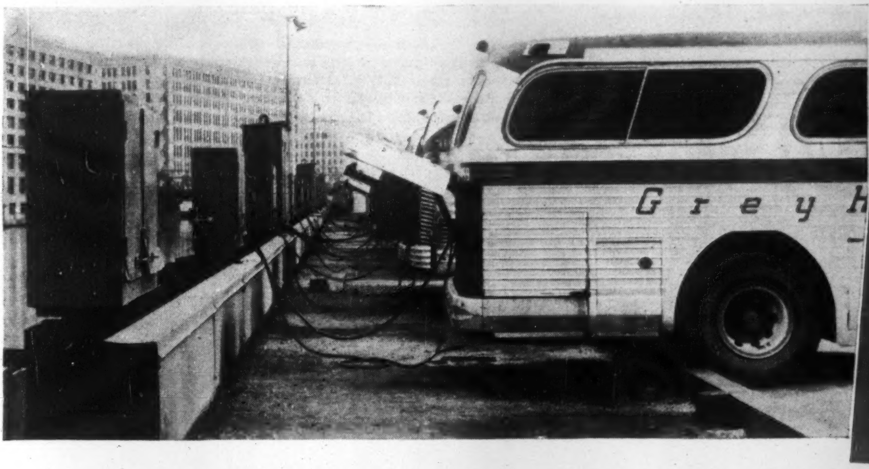
WALWORTH

Manufacturers since 1842

valves . . . pipe fittings . . . pipe wrenches

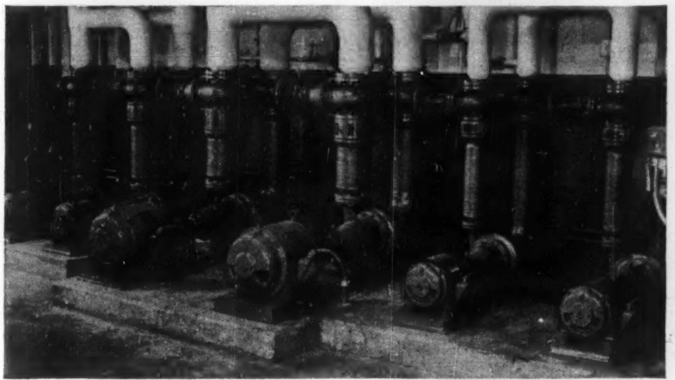
60 East 42nd Street, New York 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD



BUS PRE-HEATING BY B&G

NOVEL APPLICATION OF FORCED HOT WATER PRE-HEATS BUS ENGINES . . . SUPPLIES HEAT TO GARAGE AND OFFICES



Battery of B & G 1510 Centrifugal Pumps circulates hot water to unit heaters in the garage, convectors in the offices and to the heat exchanger stations for bus pre-heating.

Earl Webster
Chief Engineer and Architect
for Greyhound Bus Lines.

Robert E. Hattis
Consulting Engineers, Inc.

Lloyd Wareham
Architect and General Contractor

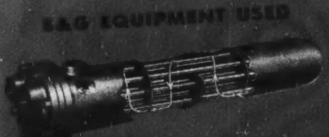
Chicago Conditionaire Co.
Heating Contractor

Diesel bus engines must be pre-heated before putting into operation and, in addition, bus interiors warmed for passengers' comfort. Use of the engine to warm the bus results in extra fuel consumption and wear on the engine.

At the Greyhound Bus Garage in Chicago, this problem has been economically solved by a B & G *Hydro-Flo* System, which both pre-heats the busses and heats the garage and offices.

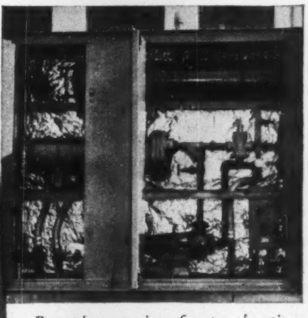
Hot water from the main building boiler is circulated by B & G 1510 Centrifugal Pumps to eight heat exchanger stations, located on the garage ramp. At these stations, B & G Type "WU" Heat Exchangers transfer heat from the boiler water to water which is circulated by B & G 1510 Pumps to forty hose stations, each servicing two busses. Hot water is supplied through hoses to the engine block and heater. Pre-heating time varies between 15 and 30 minutes, depending upon outside temperature.

B&G EQUIPMENT USED



B&G TYPE "WU" HEAT EXCHANGER
Pumped circulation produces a large volume of hot water from a small unit.

B&G 1510 CENTRIFUGAL PUMP
Base mounted, flexible coupled, single stage unit with capacities to 1,200 GPM, heads to 320 Ft.



Pumping station for pre-heating busses equipped with B & G Type "WU" Heat Exchanger and B & G 1510 Centrifugal Pump.

For information on B&G *Hydro-Flo* Heating Products, send for catalog

BELL & GOSSETT COMPANY

Dept. DL-5, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto, Canada

Below: The Gateway Center — imposing and beautiful indication of Pittsburgh's extensive "face lifting." The air conditioning system in these buildings sets new records for size and advanced features. Mechanical contractor: Kirby Saunders, Inc. Consulting Engineers: Meyer Strong & Jones. Architects: Irwin Clavan, and Eggers and Higgins. Builders: Starret Bros. & Eken, Inc. Owners and Operators are the Equitable Life Assurance Society of the United States.

"Largest commercial
air conditioning
system" uses...

ELLIOTT CROCKER-WHEELER MOTORS

PITTSBURGH'S NEW GATEWAY CENTER includes three fine modern office buildings of 20 and 24 stories, in which are 6013 individual room-cooling units, making what is reputed to be the largest commercial system of air conditioning in the world. Air, driven by 24 fans, high and low pressure, circulates at the rate of 750,000 cfm. Water piping required totals 72 miles, carrying water at 7500 gpm.

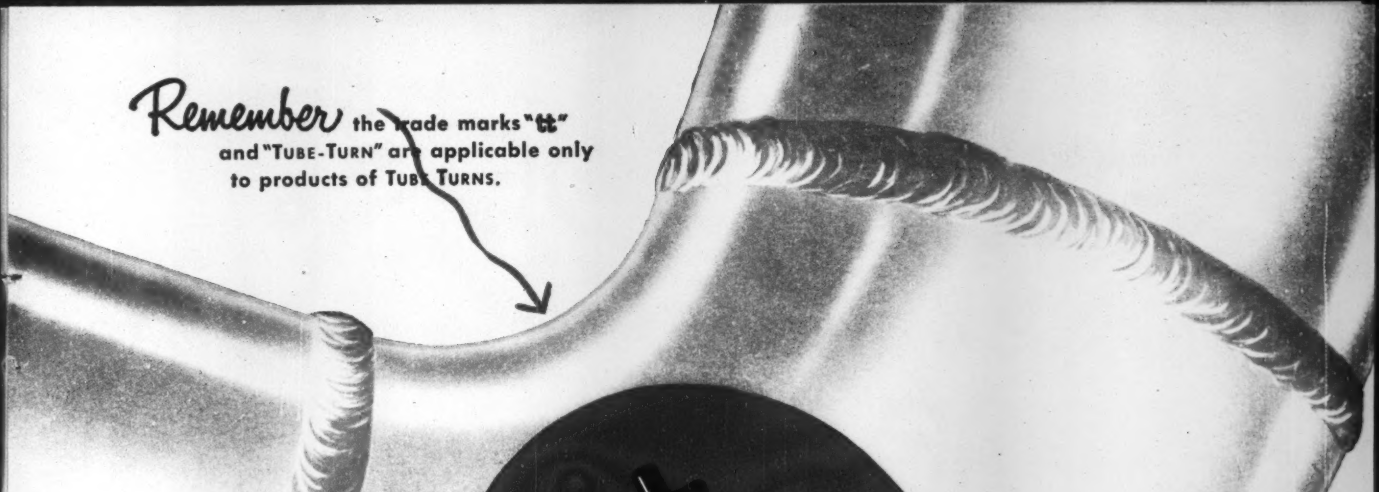
In this large installation many Elliott Crocker-Wheeler motors drive intake fans, exhaust fans, cooling water pumps and refrigeration pumps. For the details which indicate why these motors were selected for this outstanding job, contact your local Elliott representative or write Elliott Company, Crocker-Wheeler Division, Ampere, N. J.

Above: Close-up of one of the numerous Elliott C-W motors that handle important drives in the huge air conditioning system. This is one of three 200-hp, 1170-rpm drip-proof induction motors that drive the 4600-gpm, 125 ft. head condenser-water pumps. Other Elliott motors from 7½ hp up are driving the many pumps and fans at the Gateway Center.

ELLIOTT Company

W4-2

TURBINE-GENERATORS TURBINES MOTORS GENERATORS DEAERATING HEATERS EJECTORS CONDENSERS COMPRESSORS TURBOCHARGERS TUBE CLEANERS STRAINERS


Remember the trade marks "tt" and "TUBE-TURN" are applicable only to products of TUBE TURNS.

the complete line FOR ALL YOUR NEEDS

YOU CAN specify TUBE-TURN Welding Fittings and Flanges and know that you will get the *exact* answer to your specific piping problem. This leading line includes more than 4,000 items, in all piping materials . . . carbon steels, non-ferrous metals and alloys . . . schedules and sizes to match *your* design.

Carbon steel elbows, for example, are available from ½″ to 42″ diameter. Your nearby Tube Turns' Distributor provides this *complete* line promptly and backs it up with the thorough Engineering Service and how-to-do-it information of Tube Turns.

The Leading Manufacturer of Welding Fittings and Flanges

TUBE TURNS LOUISVILLE 1, KENTUCKY

A Division of National Cylinder Gas Company

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Cleveland • Toledo • Chicago • Denver • Los Angeles
San Francisco • Seattle • Atlanta • Tulsa • Houston • Dallas • Midland, Texas

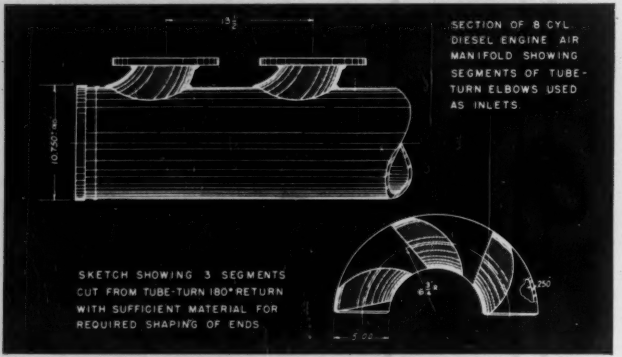
ENGINEERING SERVICE

Here's *Service* to help you solve your piping problems

Tube Turns' Engineering Service Division makes available a vast fund of experience for the solving of design and operating problems in piping. For example:

An engine builder was fabricating manifolds from formed plate. Poor fitup was a problem and costs were excessive. Tube Turns' engineers suggested using Tube-Turn Welding Returns, cut with templates as shown in the sketch. Costs came down. The dimensional uniformity of Tube-Turn Welding Returns and Elbows simplifies fabrication jobs such as this because they can be cut to odd angles and adapted to special requirements.

TUBE TURNS IS AT YOUR SERVICE!


13 1/2
10.750" OD
SECTION OF 8 CYL. DIESEL ENGINE AIR MANIFOLD SHOWING SEGMENTS OF TUBE-TURN ELBOWS USED AS INLETS.
SKETCH SHOWING 3 SEGMENTS CUT FROM TUBE-TURN 180° RETURN WITH SUFFICIENT MATERIAL FOR REQUIRED SHAPING OF ENDS
6 3/4 R
.250
5.00

Header connection design problem solved by Tube Turns' Engineering Service.

Want Piping Information?

TUBE TURNS is recognized the world over for its leadership, not only in the field of welding fittings and flanges, but as a source of authentic information on piping design.

pipe
and fitting
materials

TUBE TURNS, Dept. A-3
224 East Broadway, Louisville 1, Kentucky

Please send me free copy of Pipe and Fittings Materials.

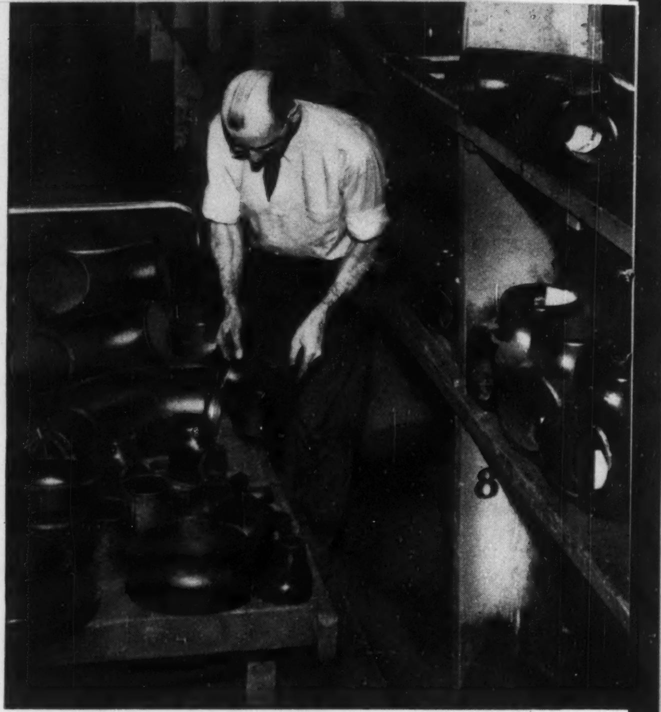
Company Name ______________________________

Company Address ____________________________

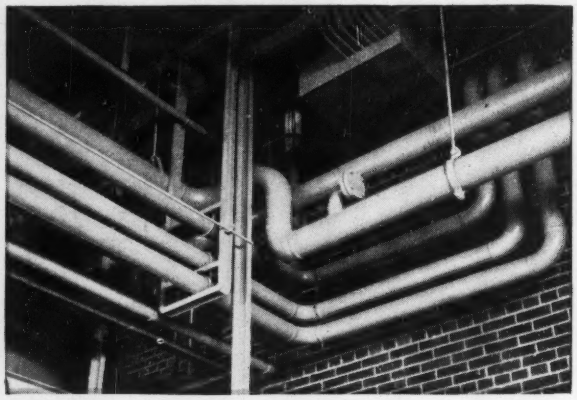
City ____________________ *Zone* ____ *State* __________

Your Name __________________________________

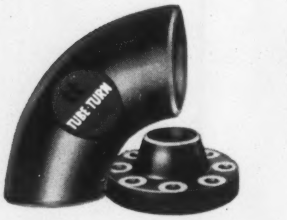
Position ____________________________________



YOUR NEEDS in welding fittings and flanges are met *promptly* by your Tube Turns' Distributor. This one reliable source can fill *all* your requirements from the world's most complete line of welding fittings and flanges comprising more than 4,000 items.



MANY USES. Piping in this modern edible oil plant conveys natural gas, hydrogen, oil, steam, cooling water, refrigerants, air and vegetable oil. All critical lines are welded and TUBE-TURN Welding Fittings are used for directional changes. Pipe sizes vary from 2" to 16".



DISTRICT OFFICES

New York	San Francisco
Philadelphia	Seattle
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Chicago	Tulsa
Denver	Houston
Los Angeles	Dallas

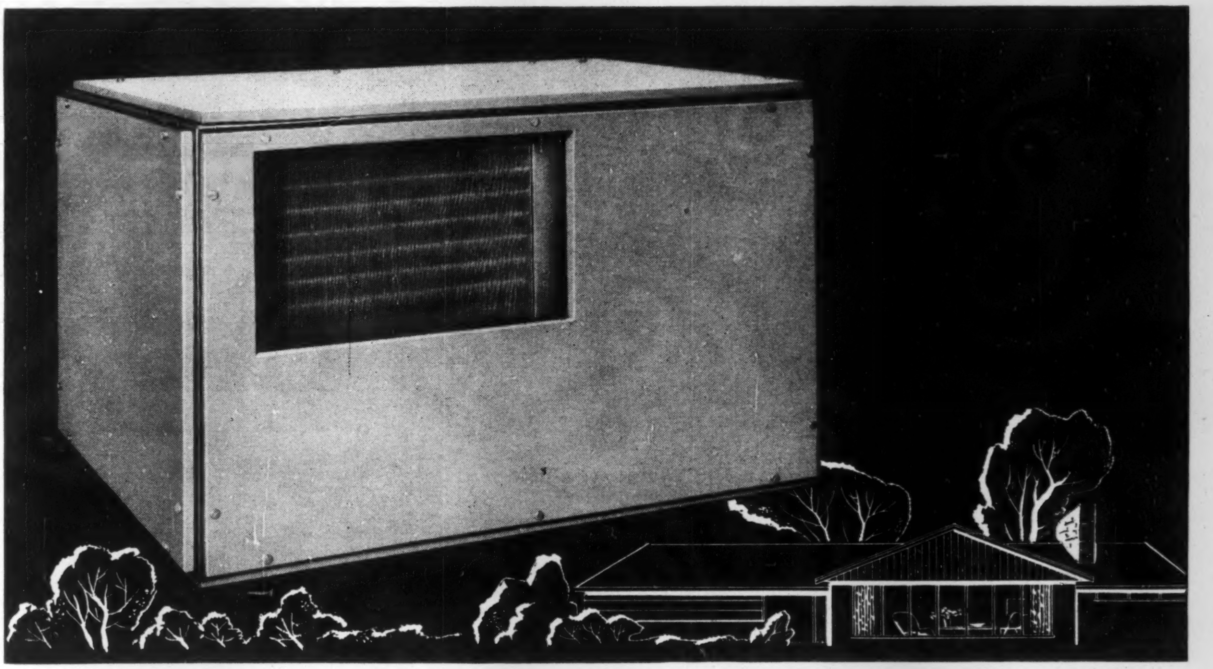
Midland, Texas

"tt" and "TUBE-TURN"
Reg. U. S. Pat. Off.

TUBE TURNS

LOUISVILLE 1, KENTUCKY
A DIVISION OF NATIONAL CYLINDER GAS COMPANY

NEW! 2 HP Westinghouse Comfort Cooler



Priced for Volume Sales in 3 Mass Markets

Sell this small, rugged unit to shops, offices, small homes. It gives you a low price for slug-it-out competitive selling—yet it delivers all the cooling and dehumidification that stores or small homes need. Light weight and small size make it suitable for mounting anywhere. Quiet operation appeals to professional people and home owners. Put this powerful new Westinghouse price leader to work for you today. Call your nearest franchised Westinghouse distributor, or write Air Conditioning Division, Westinghouse Electric Corporation, Hyde Park, Boston 36, Mass.

NEW AIR-COOLED CONDENSERS, TOO!

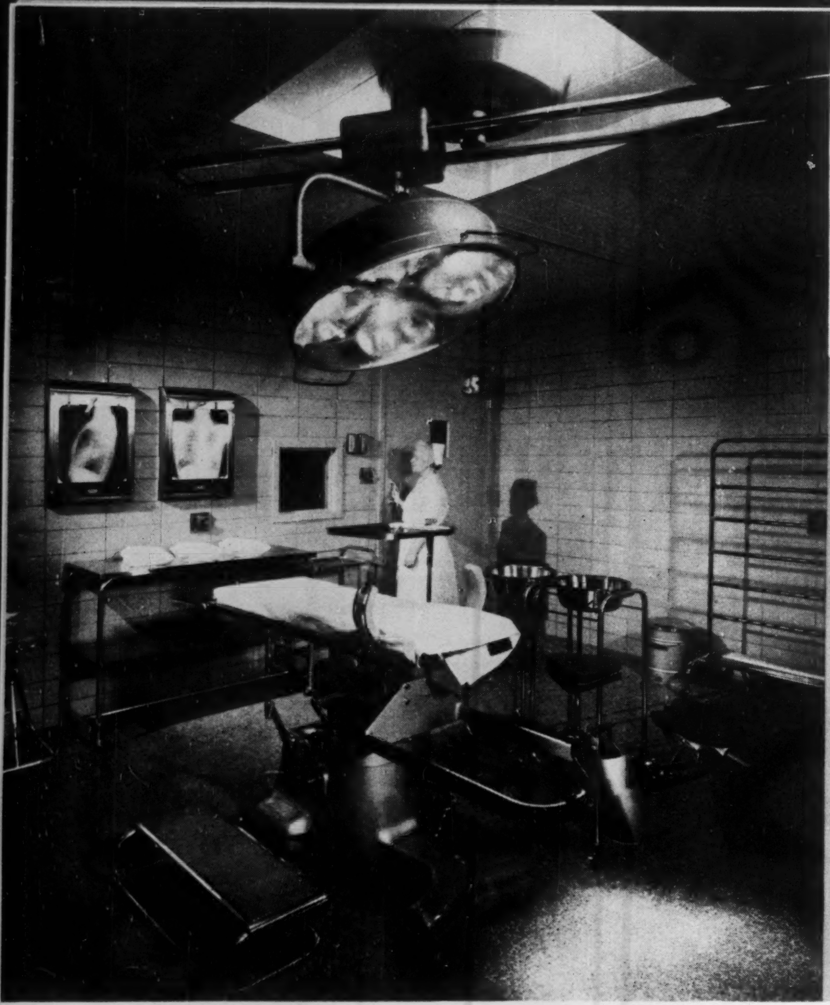
Where water is scarce or expensive, new Westinghouse AIR-cooled condensers fit the bill. Available now for air conditioning installations of 2 HP and up.

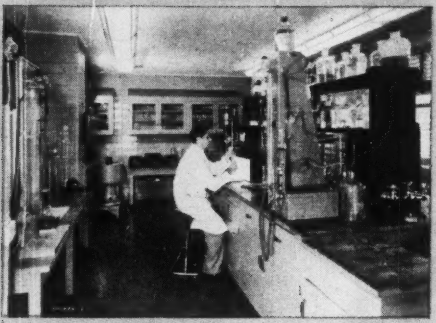
WESTINGHOUSE AIR CONDITIONING

YOU CAN BE SURE...IF IT'S Westinghouse

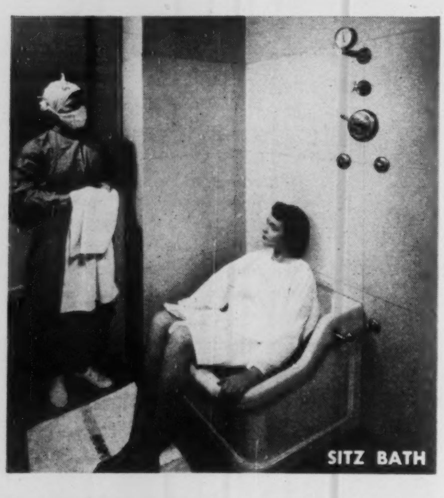
J-803 87

Temperature





One of Three Modern Air Conditioned Operating Rooms pneumatically controlled by Powers Thermostats and Hygrostats. Photo above shows modern Thoracic type operating table. X-Ray Room and Research Lab, (at right) and other spaces thruout this modern nine story building also are Powers controlled.

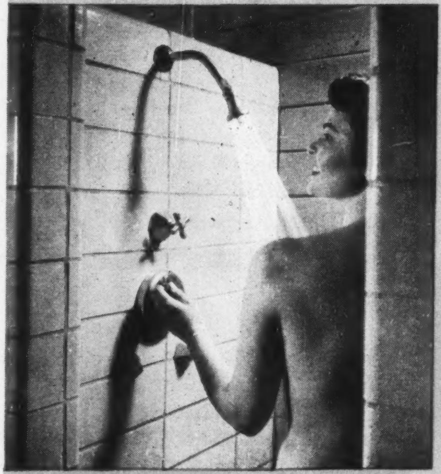


POWERS THERMOSTATIC WATER MIXERS

insure utmost Comfort and Safety in shower baths for doctors and nurses adjoining the operating rooms. Sitz baths and showers located throughout the building for patients also are equipped with Powers Thermostatic Water Mixers.

WARMER
POWERS

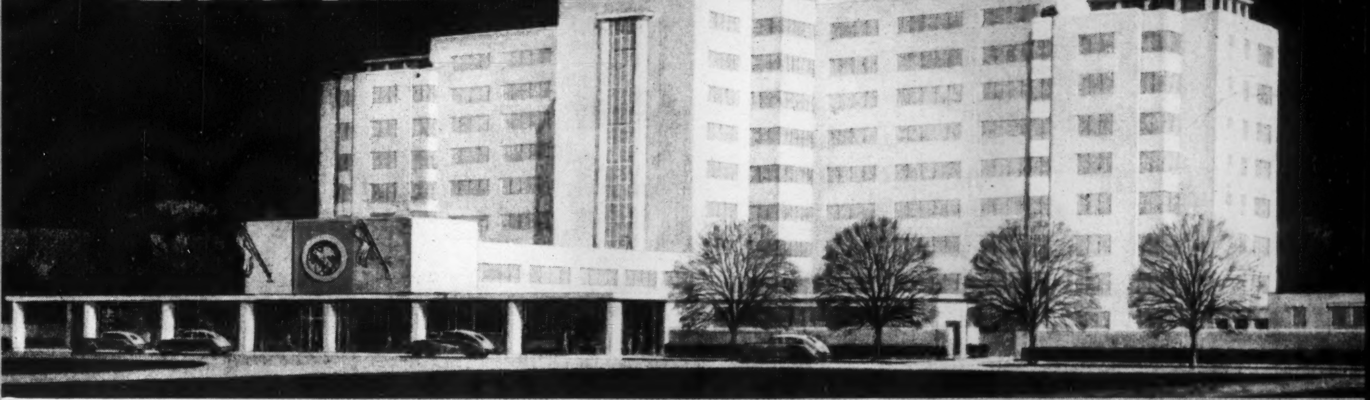
POWERS Thermostatic Water Mixer complies fully with Veterans Hospital safety requirements in Federal Specifications WW-P541a.



Plumbing Fixtures and Trim: AMERICAN RADIATOR & STANDARD SANITARY CORP.

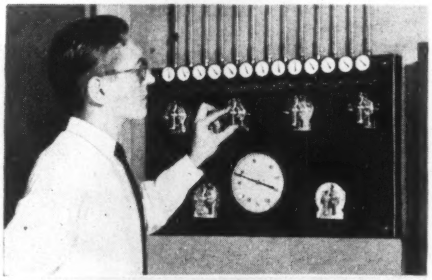
Throughout This Modern TB Sanitarium is POWERS Controlled

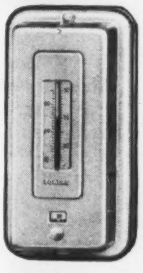
LUNG IMMOBILIZER



NEW CHICAGO STATE TUBERCULOSIS SANITARIUM

SUPERVISING ARCHITECT, STATE OF ILLINOIS, C. HERRICK HAMMOND • ASSOCIATE ARCHITECT, PHILIP B. MAHER
CONSULTING ENGINEER: ROBERT E. HATTIS
HEATING CONTRACTOR: ECONOMY PLUMBING & HEATING CO. • PLUMBING CONTRACTOR: M. J. CORBOY CORP.

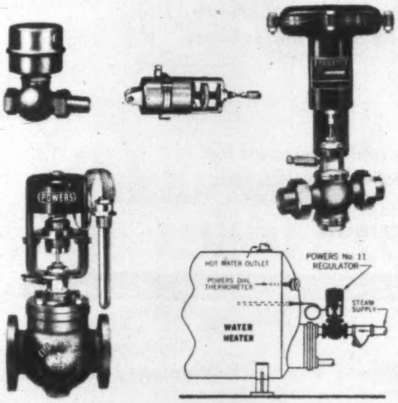




Here is one of the nation's most colorful modern TB Sanitariums. It is equipped with the latest medical research facilities for carrying on the fight to eradicate tuberculosis.

No other firm but Powers can supply the great diversity of temperature controls now required in modern hospitals for heating, air conditioning, blood banks, hydrotherapy, shower baths, dishwashers, laundry dryers and all types of water heaters. Only a few of our complete line of controls used in the above building are shown.

Experience gained by Powers in this and many other important buildings should be valuable when you need help in selecting temperature control. Why not call in Powers on your next job?



THE POWERS REGULATOR COMPANY

SKOKIE, ILL. • OFFICES IN OVER 50 CITIES IN U.S.A., CANADA, AND MEXICO
SEE YOUR PHONE BOOK

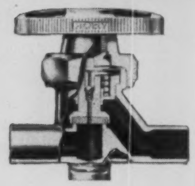
OVER 60 YEARS OF AUTOMATIC TEMPERATURE CONTROL

(b49)

HENRY LINE VALVES really give you something extra

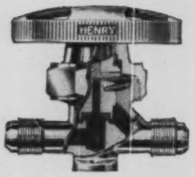
They give more dependable service because of advanced field-proven design and construction as well as patented features.

PACKLESS VALVES
FOR FREON
with Exclusive Balanced-Action



STANDARD TYPE

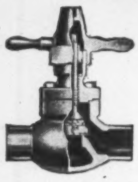
Ball check in balancing channel permits diaphragm inspection and replacement with valves under line pressure. Sizes, 1/4" thru 5/8" flare; 1/4" thru 1 5/8" O.D. Solder, 1/4" thru 1/2" F.P.T.



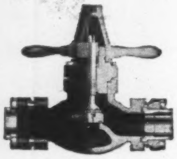
BLUE BANTAM TYPE

Same as standard Balanced-Action valve except that diaphragms cannot be inspected or replaced under line pressure. Size 1/4" thru 5/8" flare and O.D. Solder.

PACKED VALVES
FOR FREON
Bronze-Wing Cap Type



Globe and angle types with solder connections, bolted bonnets, sizes 7/8" thru 5 1/8" O.D.

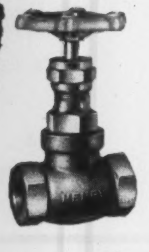


SEMI-STEEL WING CAP TYPE

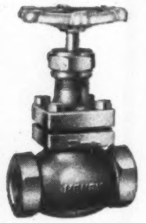
With bolted bonnets and square companion flanges. Furnished with brass tailpieces (O.D. Solder) 1 3/8" thru 5 1/8" or with steel tailpieces for welding to pipe, sizes 1 1/4" thru 5".

Also Globe and angle types with F.P.T. connections, sizes 1/2" thru 2".

PACKED VALVES
FOR AMMONIA
Permanent-Mold Iron and Semi-Steel



Compact and strong with self-aligning stem disc. Sizes (F.P.T.), screw bonnet: 1/4" thru 1", bolted bonnet 1 1/4" thru 2"—with flange connections 1 1/4" thru 5".



HENRY—Standard equipment by leading Manufacturers, Army, Navy, Coast Guard and Maritime Commission • Stocked by Leading Jobbers

WRITE FOR CATALOGS

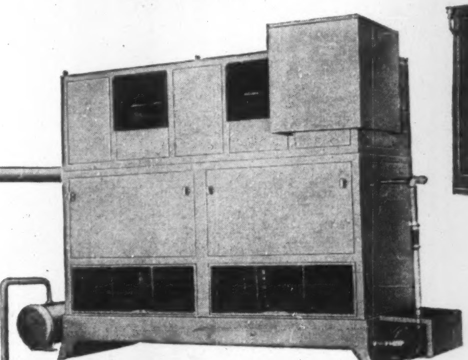
HENRY VALVE CO.

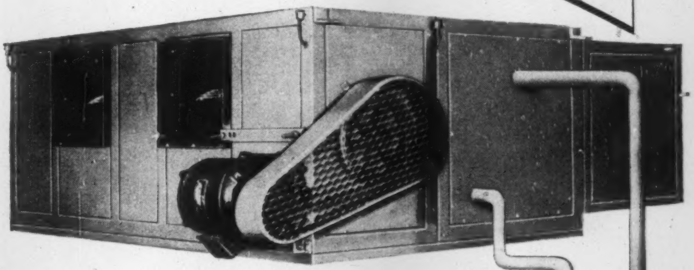
HENRY VALVE CO
CONTROLLING FLOW SINCE 1914

Valves—Driers—Strainers—Control Devices and Accessories for Refrigeration, Air Conditioning and Industrial Applications

MELROSE PARK, ILL. (CHICAGO SUBURB)
CABLE: HEVALCO, MELROSE PARK, ILLINOIS
®

THE KENNARD *Engineered* LINE COMPLETES THE JOB





KENNARD AIR CONDITIONING BLOWER UNITS

are adaptable to all forms of air conditioning installations. 13 sizes, 400 to 21,600 C.F.M. Vertical or Horizontal.

KENNARD EVAPORATIVE CONDENSERS AND COOLING TOWERS

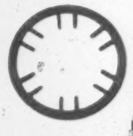
meet present day demands for efficient water saving. Rugged enough for Outdoor, quiet enough for Indoor, 3 to 75 tons.

Complete the job with other KENNARD products

Coils—Cooling or Heating.
Multi-Zone Air Conditioning Units
Heating and Ventilating Units
Sprayed Coil Dehumidifiers
Cooling Towers

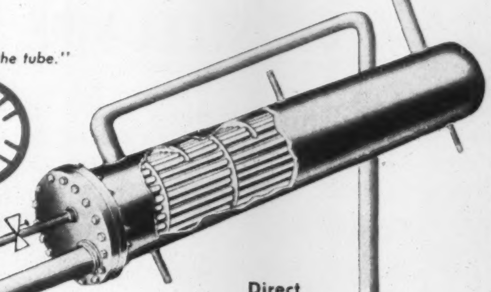
OUR 20th YEAR
AIR CONDITIONING EQUIPMENT
1934 1954
KENNARD CORPORATION
ST. LOUIS MISSOURI

"It's in the fin and the fin is in the tube."

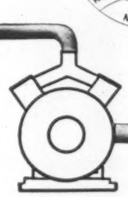


Cross Section of Chiller Tube developed by KENNARD.

Pat. Applied For.



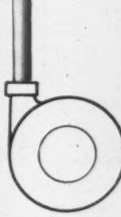
Direct Expansion Freon 12-22



Compressor *(by others)*

KENNARD SHELL AND TUBE LIQUID CHILLERS

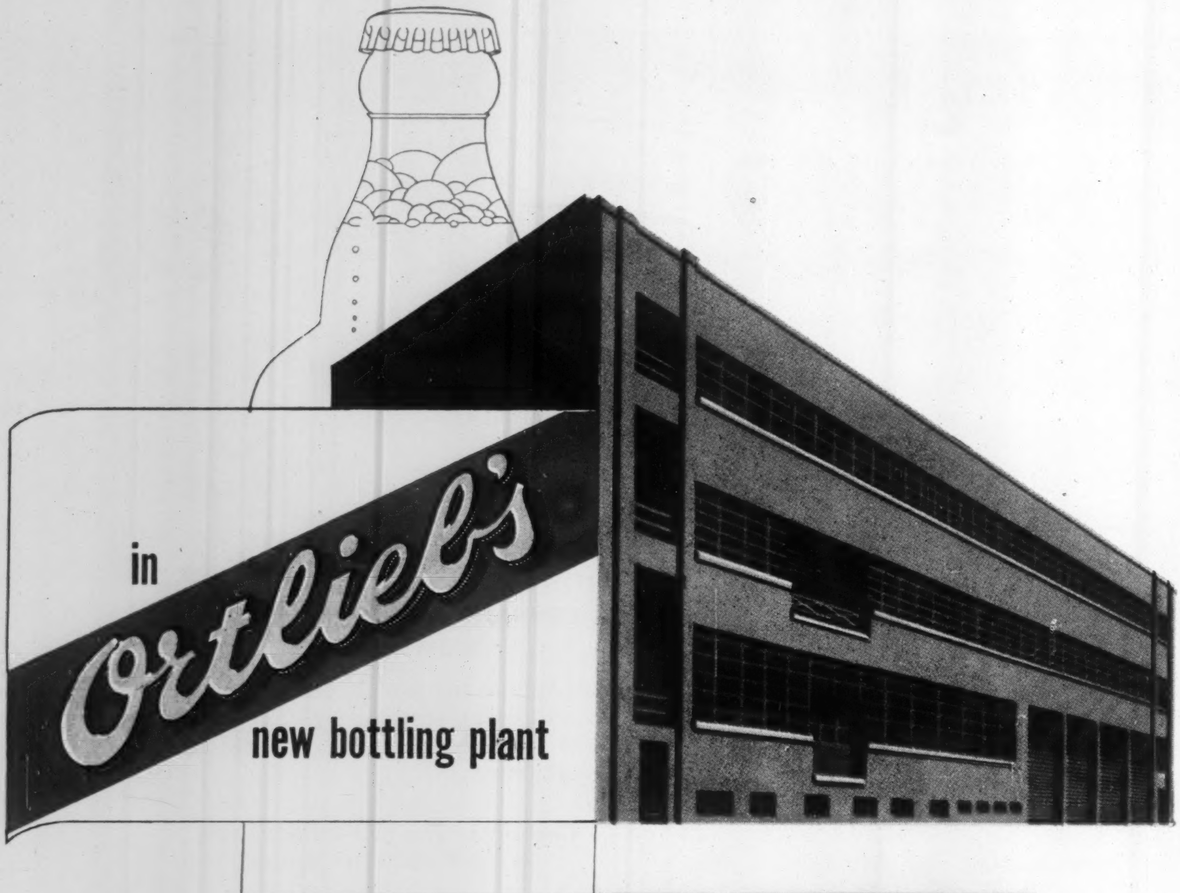
Revolutionary internally finned tubing (exclusive with KENNARD) makes them better than 50% lighter and smaller—positive oil return—no Freon head gasket—smaller Freon charge. Sizes 2 to 200 tons.



Pump *(by others)*

KENNARD CORPORATION

1817 S. HANLEY RD. • ST. LOUIS 17, MO.



in Ortlieb's new bottling plant

a complete SPANG® CW STEEL PIPE installation

With 85 years' experience in the brewing business, Ortlieb Brewing Company, Philadelphia, knows what it takes to turn out quality beer and ale. Ortlieb brewers know that in order to make *top-quality* beverages you need *top-quality* ingredients.

The architects and contractors who constructed Ortlieb's new bottling house know that a building, too, is only as good as the materials which go into it. That's why they specified *top-quality* Spang CW Steel Pipe to handle the heating, plumbing and drainage for the new plant.

Like the products it serves, Spang CW Steel Pipe is a *quality* product . . . made from the highest-grade skelp . . . carefully controlled and inspected throughout production . . . and thoroughly tested before shipment. This care in manufacture assures you a product which is easy to cut, thread and bend . . . saving you valuable installation time and money.

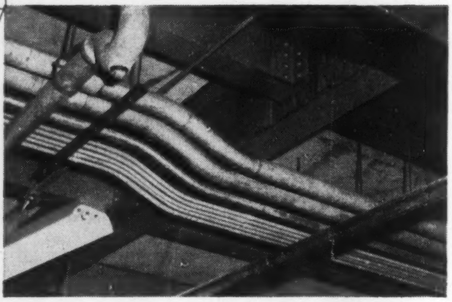
Top-quality Spang CW Steel Pipe is available at no extra cost. Don't just buy pipe . . . buy Spang CW Steel Pipe for your next installation.

Write for complete information and for the name of your nearest Spang Distributor.

Owner: Henry F. Ortlieb Brewing Co., Philadelphia, Pa.
Architect, General Contractor and Piping Contractor: W. F. Koelle Co., Philadelphia, Pa.
Spang Distributor: H. B. Pancoast Co., Philadelphia, Pa.

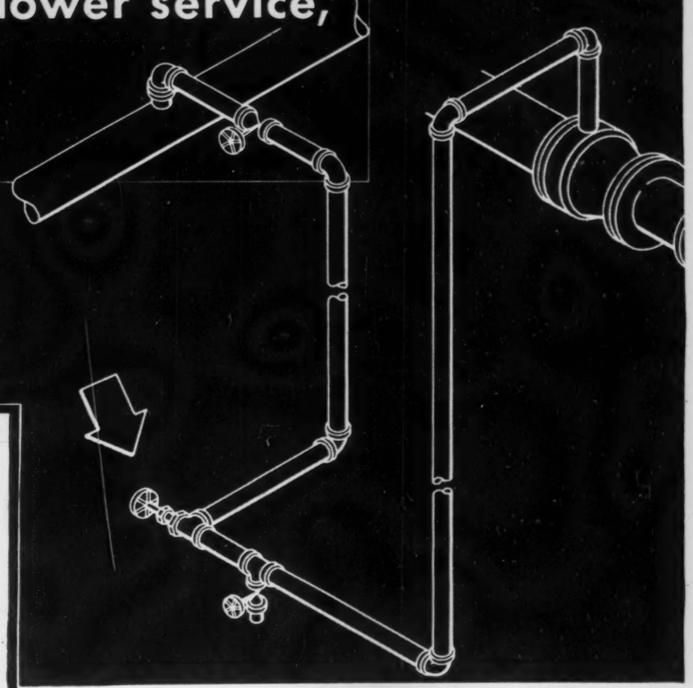
SPANG

SPANG-CHALFANT
DIVISION OF THE NATIONAL SUPPLY COMPANY
General Sales Office: Two Gateway Center, Pittsburgh, Pennsylvania. District Sales Offices: Atlanta, Boston, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis.



Single Valve Saving $150 Yearly

. . . on severe ash blower service, for example . . .



The Installation

At City Light & Power Company, Washington, Indiana—with Crane bronze angle valve in 2-inch steam line to boiler ash blower manifold. Working pressure: 300 psi, 525 degrees F.

Valve Service Ratings

SUITABILITY:
Perfect match for needs

FEATURES:
Crane Plug Type Disc

MAINTENANCE COST:
One stem replaced in 3 years

SERVICE LIFE:
Already 12x former valves

OPERATING RESULTS:
Over $400 saved to date

AVAILABILITY:
Crane catalog item—No. 384P

The Valve

Crane plug-type disc and seat design make a most effective seating combination for tough steam service. Highly resistant to damage by foreign matter, wire-drawing, erosion, cutting, galling, etc. The wide tapered disc allows fine, accurate throttling. These rugged bronze valves come in globe and angle patterns; see your Crane Catalog or Crane Representative.

CRANE
300 S
1000 WOG

The Case History

Valves formerly had to be replaced every 8 to 12 weeks, their cost alone exceeding $150 yearly. It's a tough spot even for a good valve.

The valve's location in the steam line is below the boiler water level. Each operating cycle exposes it to a long leg of condensate, with an abrupt change to hot steam direct from the boiler header. On closure, the valve is again subject to cooling, and that's the cycle about 8 times daily.

Under those conditions, this Crane No. 384P Bronze Plug Type Disc Angle Valve put a stop to former replacement cost, saving more than $400 in 3 years since installed. Still the valve remains tight, dependable, and fully fit for service. That's the result of choosing the right valve—the choice assured by Crane quality and the completeness of the Crane line.

THE BETTER QUALITY...BIGGER VALUE LINE...IN BRASS, STEEL, IRON

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

for
the
THRIFTY
BUYER

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

There is **NOTHING LIKE**

Nature's Own Insulation...

There's a Mundet Office near you

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HOUSTON 11, TEXAS
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JACKSONVILLE 6, FLA.
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LOS ANGELES, CAL.
(Maywood)
6116 Walker Ave.
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315-325 North Front St.
NEW YORK 17, N.Y.
331 Madison Ave.
PHILADELPHIA 39, PA.
856 North 48th St.
ST. LOUIS 9, MO.
3176 Brannon Ave.

In Canada:
Mundet Cork &
Insulation Ltd.
35 Booth Avenue, Toronto

The unique character of Cork is nature-made. Principal qualities required for most efficient low temperature insulation are *inherent* in Cork and have established Cork's reputation for utmost efficiency, economy and long-life.

To Cork's nature-made advantages, Mundet adds careful selection and grading of the raw material... to be sure that it is the best quality for the purpose. Mundet then fabricates the Cork into the most serviceable forms for commercial refrigeration, air conditioning and other applications of low temperature.

Modern manufacturing methods are only part of the service that Mundet provides to insure maximum satisfaction from use of Mundet Corkboard and Cork Pipe Covering. Through Mundet contract service, we take full responsibility for the proper installation of our products.
Let us show how our closely integrated service can benefit you.

MUNDET CORK CORPORATION
Insulation Division
7209 Tonnelle Ave., North Bergen, N. J.

Without obligation, send me your insulation manual, describing Mundet Cork Insulation Products.

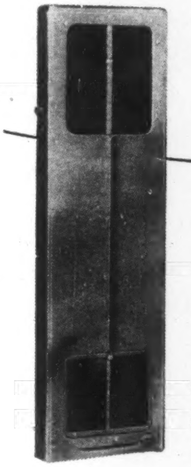
NAME ....

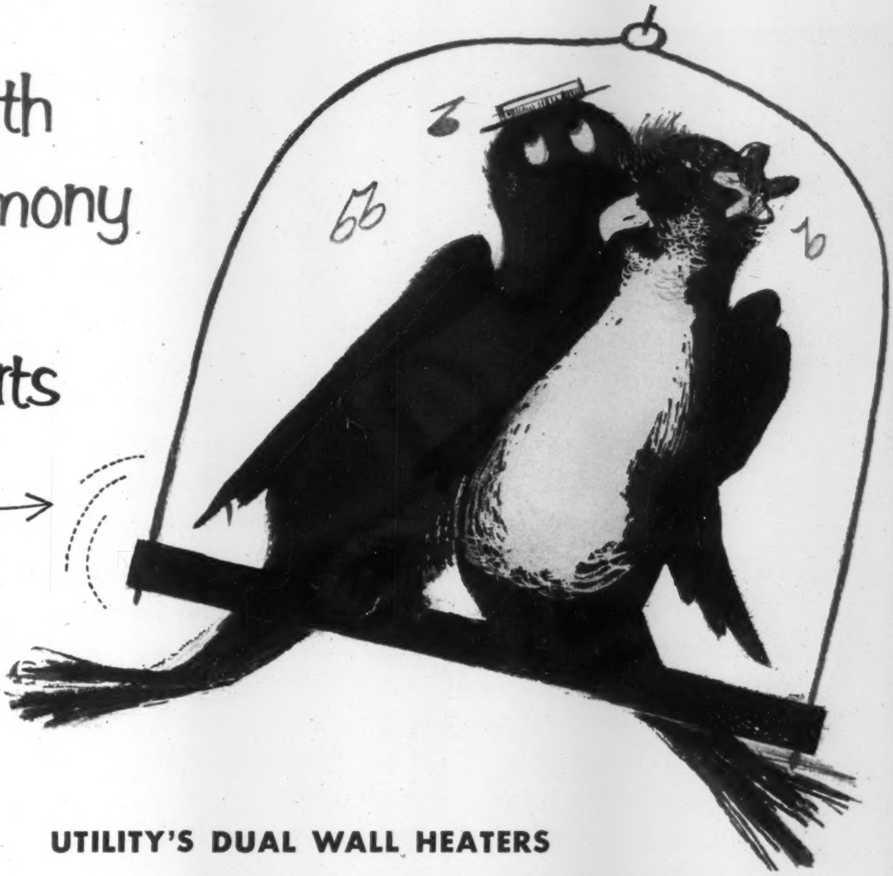
FIRM ....

ADDRESS ....

Mundet Insulation Products include: "Custom-Molded 85% Magnesia Pipe Covering, Magnesia Blocks and Segmented Covering for Heat Insulation; High Temperature Pipe Covering and Blocks; "Jointite" Cork Pipe Covering and Corkboard for Low Temperatures.

warmth and harmony in two parts





UTILITY'S DUAL WALL HEATERS

For efficient heating of two adjoining living areas, the best choice is an attractive, dependable Utility Dual Wall Heater.

Easy to slip into standard 4" stud walls, these heaters keep installation costs at a minimum. Their subdued, smartly styled front panel with rich luster baked enamel finish and matching grilles makes them welcome in every home interior.

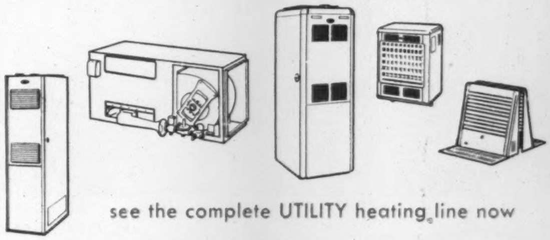
Equipped with 3-heat manual control, Utility Dual Wall Heaters are also available with thermostatic control. Adjustable damper allows for circulation of warm air to one or both living areas. High velocity discharge eliminates cold zones, drafty corners, and lazy, stagnant hot air; insures overall economical, efficient heating.

AGA-approved . . . 35,000 or 50,000 BTU. Single wall heaters, 27,500 BTU. Ideal for heating of apartments, homes or duplexes.

GAFFERS & SATTLER
AND OCCIDENTAL
AUTOMATIC GAS RANGES
UTILITY
FURNACES
AIR COOLERS
WATER HEATERS

UTILITY
TRADE MARK

a happier living family tree . . .
all branches of



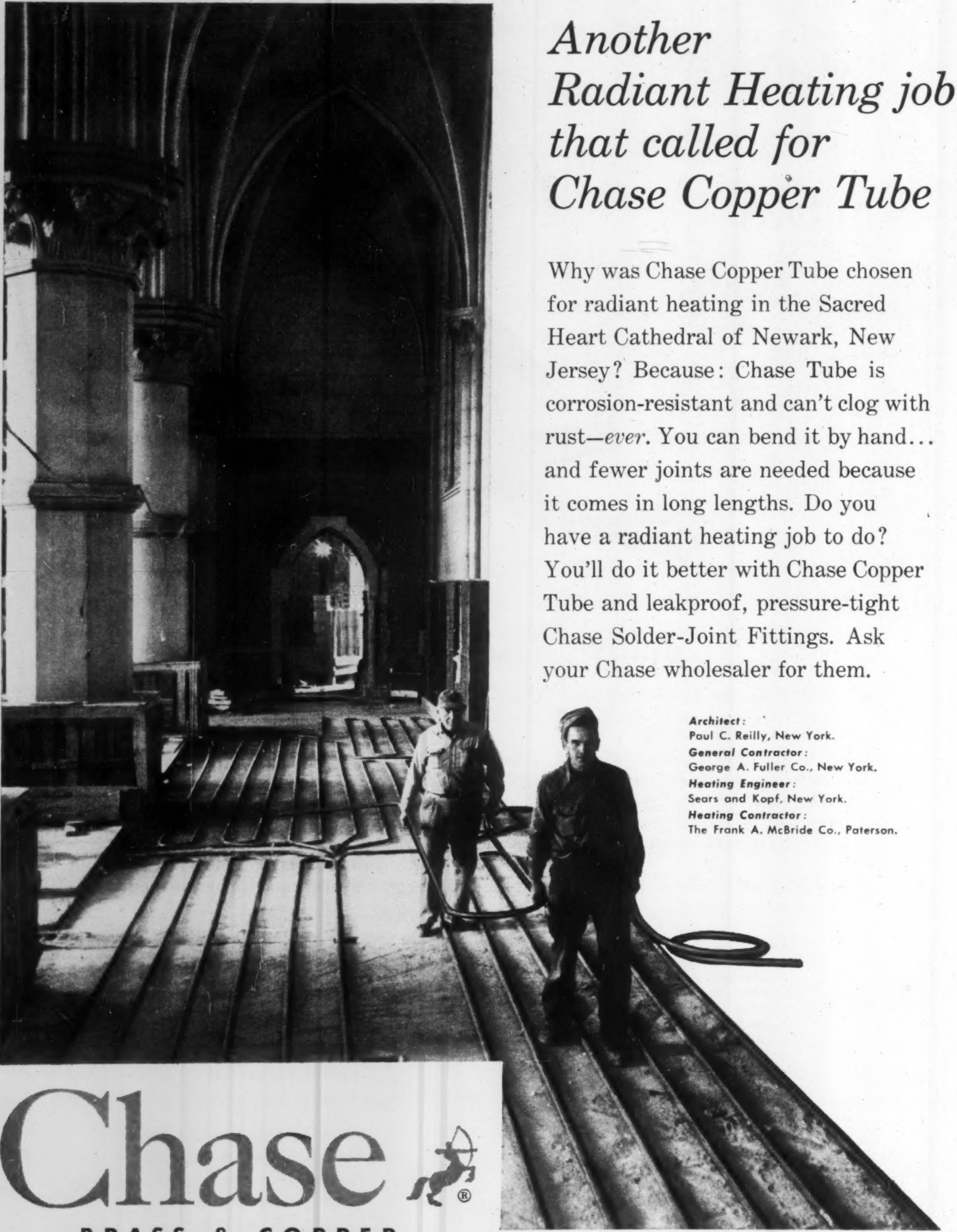
see the complete UTILITY heating line now

UTILITY
TRADE MARK

guaranteed heating performance

UTILITY APPLIANCE CORP., DEPT. HPH 6
4851 S. Alameda St., Los Angeles 58, Calif.

Please send me free information on:
☐ Utility Automatic Heating Equipment
☐ Utility Cooling Equipment
☐ Utility Automatic Gas Water Heaters
Name____________________
Address____________________
City__________ Zone___ State______



Another Radiant Heating job that called for Chase Copper Tube

Why was Chase Copper Tube chosen for radiant heating in the Sacred Heart Cathedral of Newark, New Jersey? Because: Chase Tube is corrosion-resistant and can't clog with rust—*ever*. You can bend it by hand... and fewer joints are needed because it comes in long lengths. Do you have a radiant heating job to do? You'll do it better with Chase Copper Tube and leakproof, pressure-tight Chase Solder-Joint Fittings. Ask your Chase wholesaler for them.

Architect:
Paul C. Reilly, New York.
General Contractor:
George A. Fuller Co., New York.
Heating Engineer:
Sears and Kopf, New York.
Heating Contractor:
The Frank A. McBride Co., Paterson.

Chase®
BRASS & COPPER
WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

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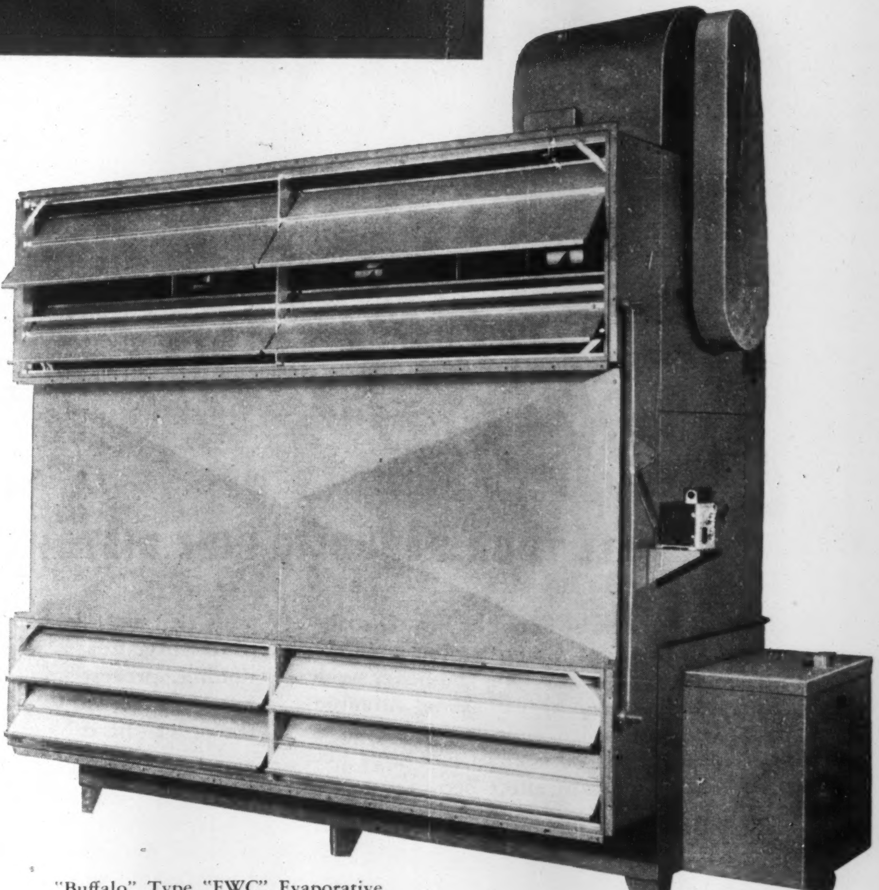
EFFICIENT HEAT EXCHANGE

WITH MINIMUM COOLING WATER

FOR COOLING IN A CLOSED SYSTEM

- jacket water of compressors
- lubricating oils
- quench oils
- Diesel jacket water
- jacket water of natural gas and other engines



"Buffalo" Type "EWC" Evaporative Water Cooler with recirculating dampers for automatic temperature control.

"BUFFALO" TYPE "EWC" EVAPORATIVE WATER COOLERS

are more and more the ideal answer to efficient, economical liquid cooling as water supplies become increasingly short. In these units, the liquid to be cooled passes thru a bank of coils continuously sprayed. Fan draft causes evaporation on the large surface of the coils and dissipates the heat. The results in this closed system — exceptionally high heat transfer in a highly compact unit—close control of liquid temperatures — very small makeup water requirements. "Buffalo" "EWC" units are available in capacities for cooling from 20 to 600 gpm of liquid, and are built in 3 basic, demountable sections for moving in thru standard building openings. High-quality parts, including "Buffalo" Pumps, Fans, Non-Clogging Spray Nozzles, Aerofin Coils, and heavy-gauge tank and paneling mean "Q" Factor* performance. Write today for Bulletin 3666A.

**The "Q" Factor — The built-in Quality which provides trouble-free satisfaction and long life.*

"Buffalo"

BUFFALO FORGE COMPANY
171 MORTIMER BUFFALO, NEW YORK
Publishers of "Fan Engineering" Handbook
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.
Sales Representatives in all Principal Cities

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING

WANT A STEEL PIPE STOCKROOM...

...absolutely FREE?

CALL YOUR REPUBLIC PIPE DISTRIBUTOR

It's true . . . your nearby Republic Pipe Distributor actually provides you with what amounts to a *free* steel pipe stockroom. You never have to worry about tying up capital or valuable warehouse storage space. There are no problems with handling costs or insurance. That's because his warehouse in effect becomes yours.

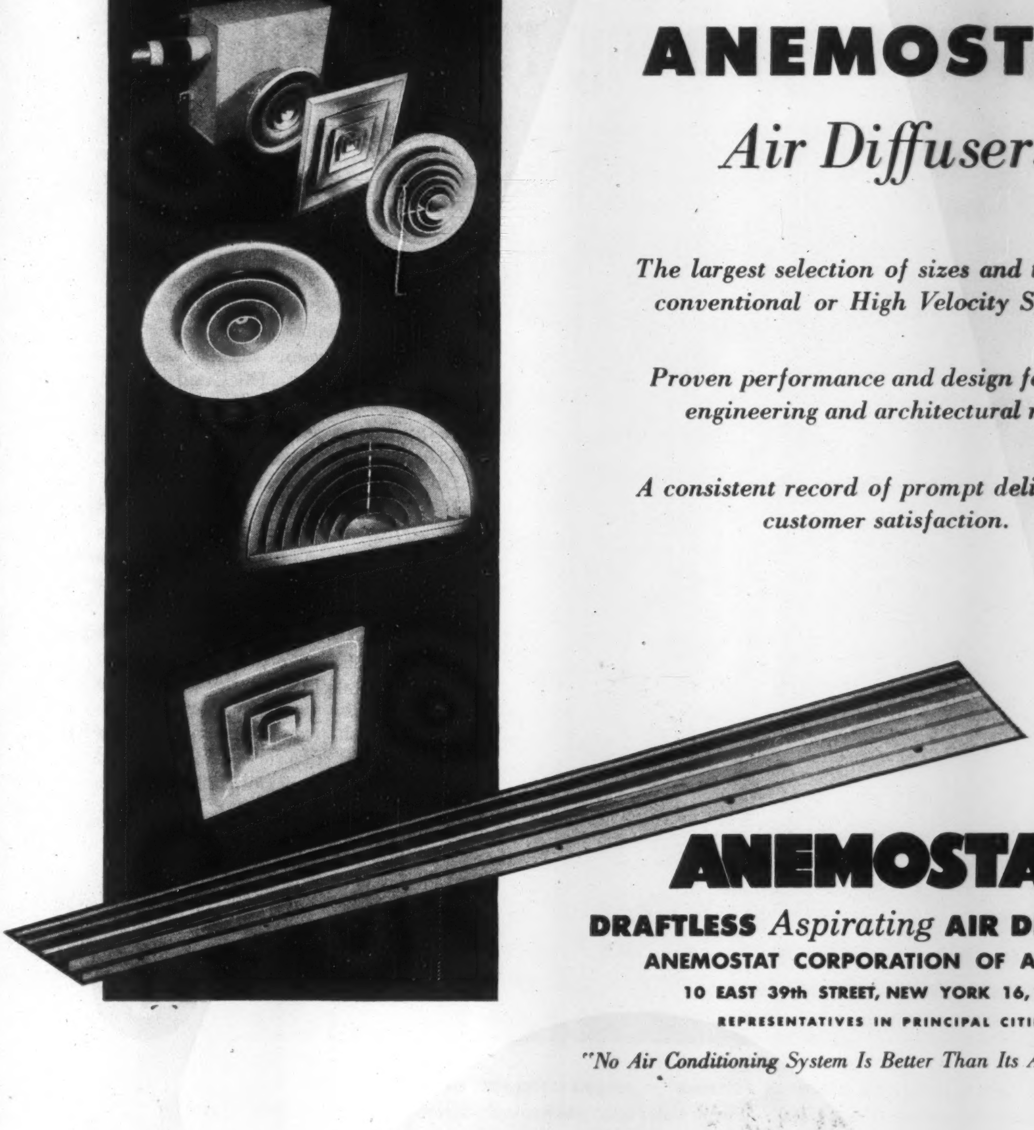
And you'll find he maintains a full line of high-quality pipe in sizes you want—plus fittings, valves, plumbing fixtures, controls, tools . . . everything needed for complete plumbing, heating, refrigeration, air conditioning, process and industrial piping jobs. Furthermore, no matter how large or small the order—he delivers in a hurry.

So, if you're looking for ways to reduce overhead—and who isn't?—you'll find it profitable to do business with your Republic Pipe Distributor. Get acquainted with him soon. He'll be delighted to serve you.

- Easy to bend, thread, and close coil
- Easy to weld by all methods
- Uniformly ductile
- Uniformly strong
- Uniformly clean and scale-free
- Uniform wall thickness, diameter, concentricity
- Economical uniform lengths, extra long lengths

REPUBLIC STEEL

REPUBLIC STEEL PIPE



This is why you should always specify and buy

ANEMOSTAT

Air Diffusers

The largest selection of sizes and types for conventional or High Velocity Systems.

Proven performance and design for every engineering and architectural need.

A consistent record of prompt delivery and customer satisfaction.

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"No Air Conditioning System Is Better Than Its Air Distribution"

AC-121

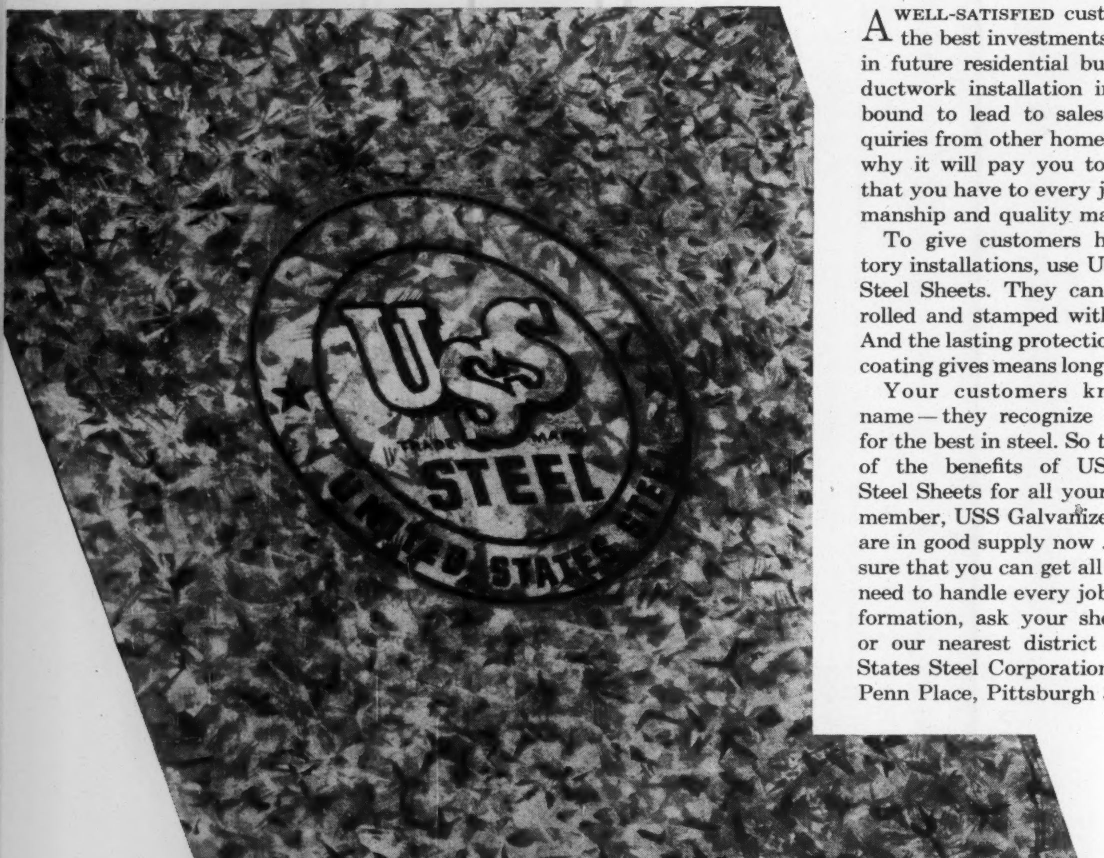
USS Galvanized Steel Sheets

—for customer-pleasing residential jobs

A WELL-SATISFIED customer is one of the best investments you can make in future residential business. A good ductwork installation in one home is bound to lead to sales-possibility inquiries from other homeowners. That's why it will pay you to give the best that you have to every job—fine workmanship and quality materials.

To give customers highly satisfactory installations, use USS Galvanized Steel Sheets. They can be cut, bent, rolled and stamped without difficulty. And the lasting protection that the zinc coating gives means long life for the job.

Your customers know the USS name—they recognize that it stands for the best in steel. So take advantage of the benefits of USS Galvanized Steel Sheets for all your jobs. And remember, USS Galvanized Steel Sheets are in good supply now . . . you can be sure that you can get all the sheets you need to handle every job. For more information, ask your sheet distributor or our nearest district office. United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.



UNITED STATES STEEL CORPORATION, PITTSBURGH · COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. · UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS GALVANIZED STEEL SHEETS

4-260

UNITED STATES STEEL

who says there's nothing new under the sun?

here's Ingersoll-Rand's NEW Motorpump

for air-conditioning service

And it's under the hot weather sun your customers will thank you for installing an Ingersoll-Rand Motorpump on their air conditioning system. Especially this new Motorpump, which is a leader in performance, size and weight. Furthermore, additional features in shaft sealing, impeller attachment and fool-proof start-up measures will mean less trouble for your customers. And, in addition to this, the new Motorpump is priced competitively.

The long, trouble-free operation record of Motorpumps speaks for itself, and comes from our quarter-century of designing and building pumps for this particular service.

Why don't you investigate today? Contact your nearest Ingersoll-Rand branch office or write for complete details about the pump that's conditioned for air conditioning.

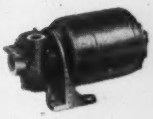
Ingersoll-Rand

Cameron Pump Division
11 Broadway, New York 4, N. Y.

The most complete pump line for air conditioning service.

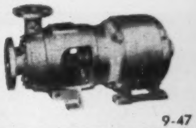
The MOTOR IR PUMP Line

⅓ to 1 hp



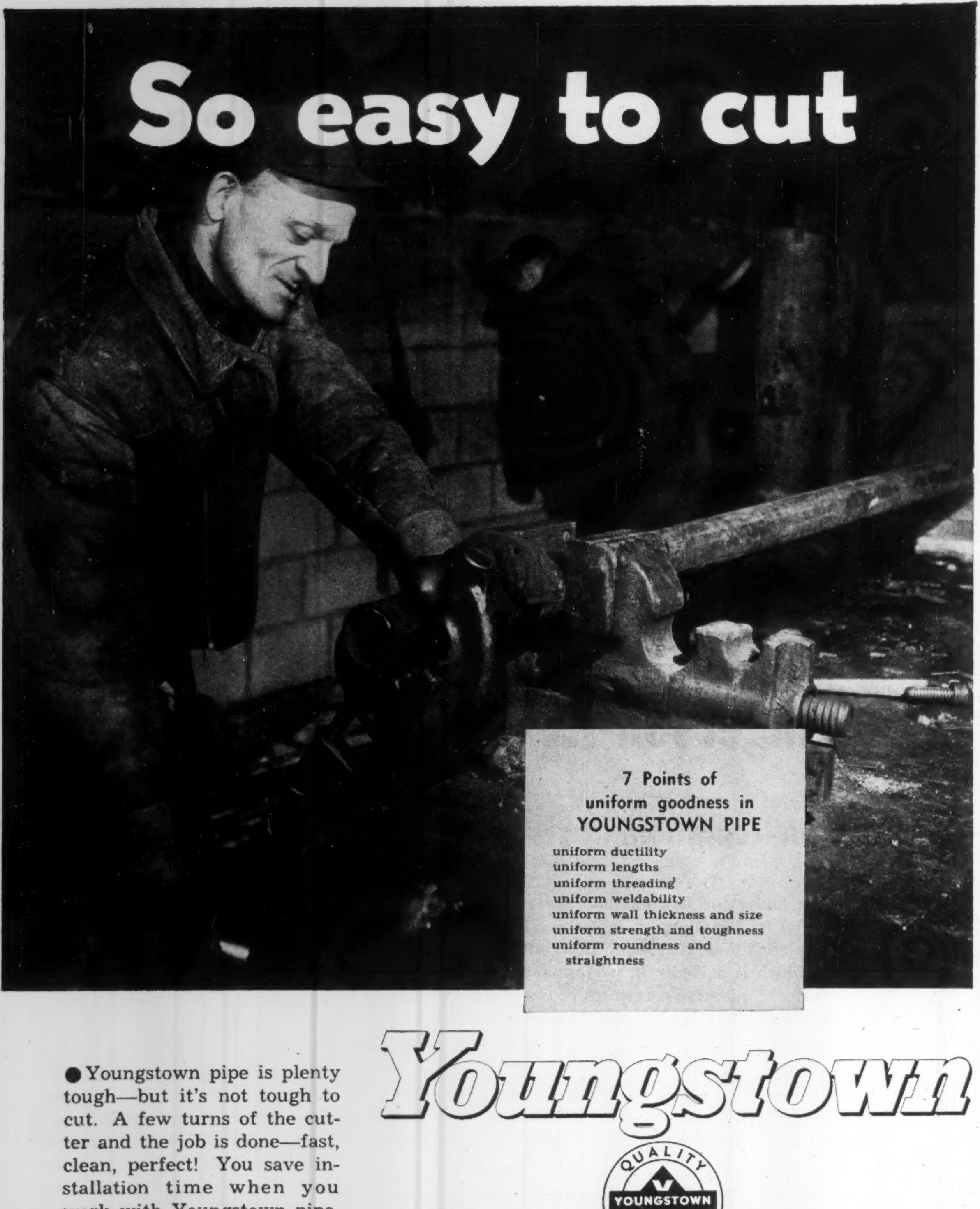
⅓ to 1½ hp

1 to 7½ hp



1 to 75 hp

9-47



So easy to cut

7 Points of uniform goodness in YOUNGSTOWN PIPE

- uniform ductility
- uniform lengths
- uniform threading
- uniform weldability
- uniform wall thickness and size
- uniform strength and toughness
- uniform roundness and straightness

● Youngstown pipe is plenty tough—but it's not tough to cut. A few turns of the cutter and the job is done—fast, clean, perfect! You save installation time when you work with Youngstown pipe.

Youngstown

QUALITY YOUNGSTOWN SERVICE

THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices: Youngstown, Ohio - Export Office: 500 Fifth Avenue, New York 36, N. Y.

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - BAR SHAPES - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - RAILROAD TRACK SPIKES

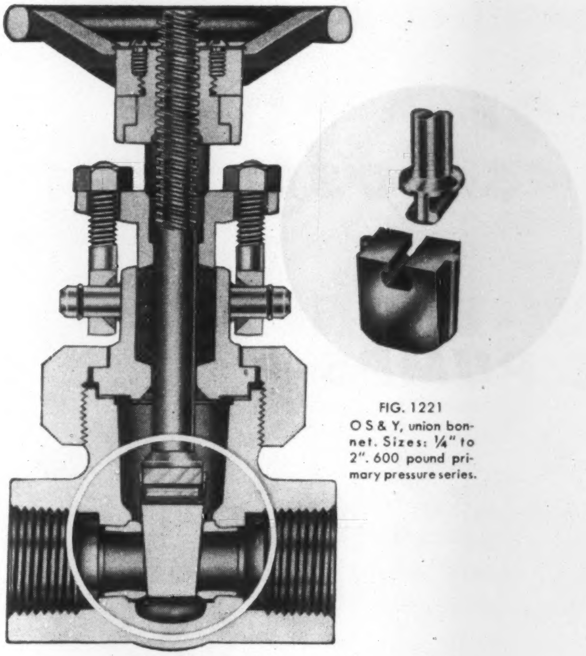


FIG. 1221
O S & Y, union bonnet. Sizes: ¼" to 2". 600 pound primary pressure series.

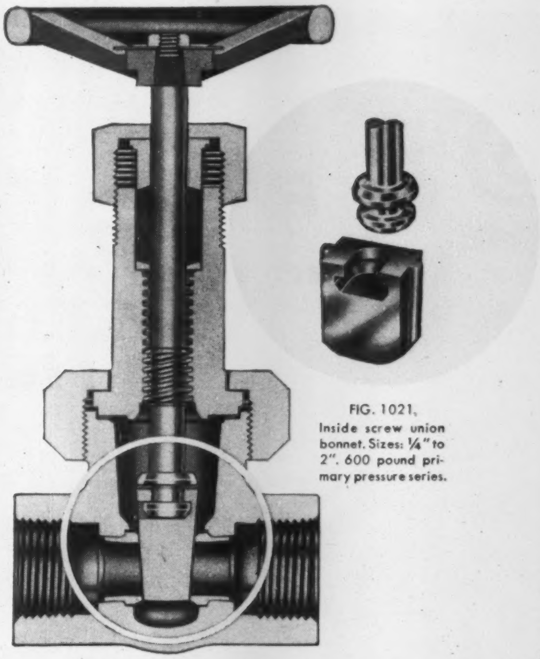


FIG. 1021,
Inside screw union bonnet. Sizes: ¼" to 2". 600 pound primary pressure series.

New design makes OIC forged steel gate valves the most modern line . . .

NEW: stronger stem-to-wedge connection. Improved, modern design increases pull-out strength to many times the theoretical requirement. This design distributes the pull-out load more efficiently throughout the wedge structure to meet the most stringent specifications of valve buyers in all fields.

NEW: wedges wear longer. Wedges are made of 13% chrome stainless steel for corrosion resistance. They are duracased to at least 1000 Brinell Hardness to prevent galling and excessive wear caused by frequent closures upon foreign particles in the flow.

NEW: union bonnet design is more efficient. Body-to-bonnet joint of the male-female type provides a recess for the gasket. It is contained more securely, reducing the possibility of leakage or a blown gasket.

OTHER OUTSTANDING FEATURES

Stem threads of all OIC inside screw, forged steel valves are always contained inside the bonnet. They can't possibly load up with corrosive matter which might be in the flow. This keeps the threads clean and free running, and contributes to longer stem wear.

Modern OIC Seal-Ever packing is a special composition which eliminates electrolytic action between the stem and the packing. This prevents stem corrosion in the packing area and helps maintain a leakproof seal.

Back-seating feature provides means of repacking valves while in service.

OS & Y valve gland "I" bolts are retained on trunnions by modern, more efficient, stainless steel snap rings.

Shoulder-type seat rings are expanded into the body under heavy pressure. They are accurately machined to mate tightly with the wedge for a positive seal.

Order modern OIC Forged Steel Valves from your nearby OIC Distributor. Write and request Folder No. 195.

OIC Forged Steel Valves are also available in globes, angles and checks in a variety of trims for any service.

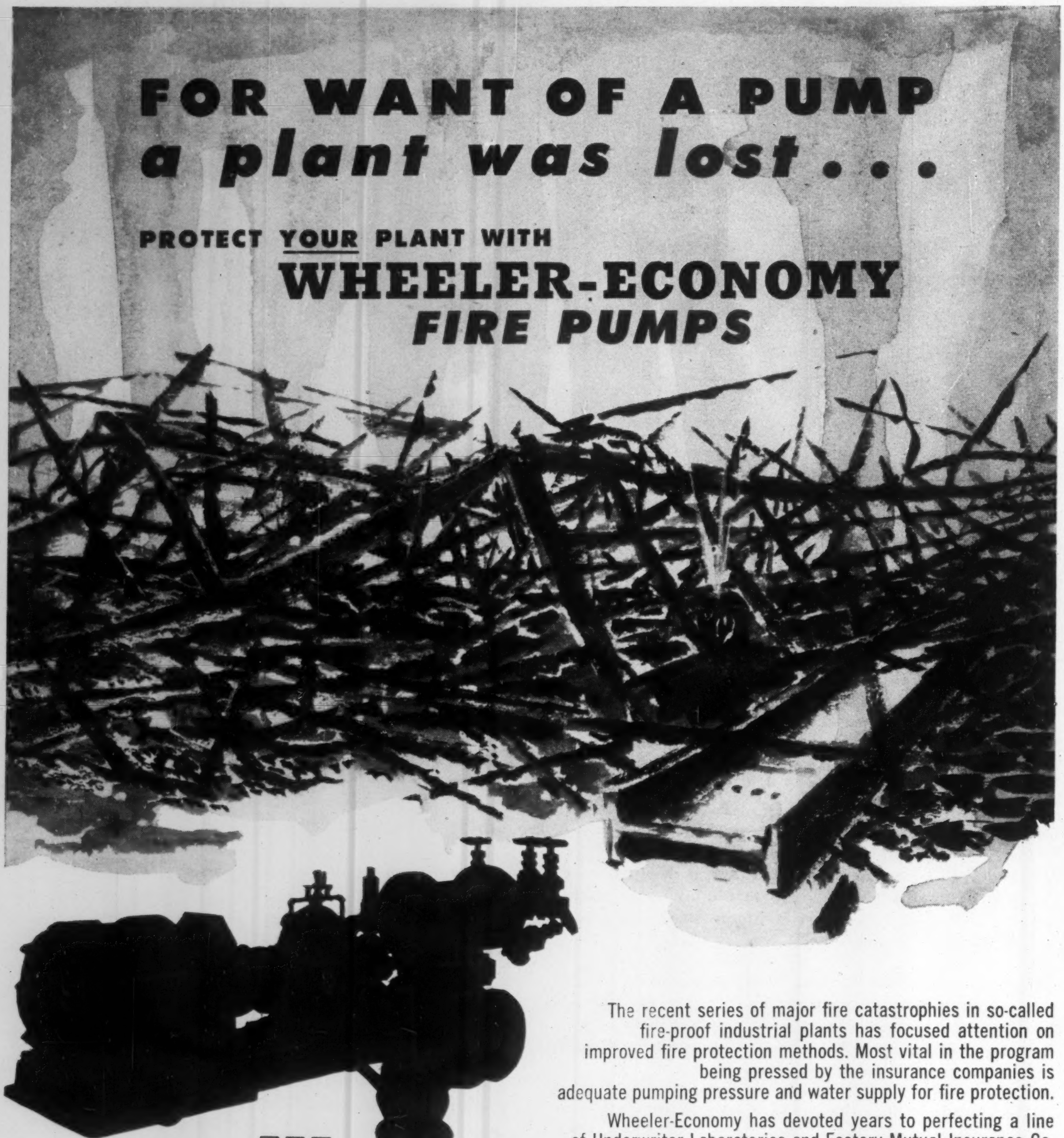
THE OHIO INJECTOR COMPANY • WADSWORTH, OHIO

OIC
FOUNDED 1883
VALVES

FORGED & CAST STEEL, LUBRICATED PLUG, BRONZE & IRON

FOR WANT OF A PUMP *a plant was lost . . .*

PROTECT YOUR PLANT WITH WHEELER-ECONOMY *FIRE PUMPS*



The recent series of major fire catastrophies in so-called fire-proof industrial plants has focused attention on improved fire protection methods. Most vital in the program being pressed by the insurance companies is adequate pumping pressure and water supply for fire protection.

Wheeler-Economy has devoted years to perfecting a line of Underwriter Laboratories and Factory Mutual Insurance Co. approved fire pumps.

Look into this line today . . . A Wheeler-Economy Fire Pump may save you untold losses in equipment, production and employment by being on the job with "pressure-plus" when fire breaks out.

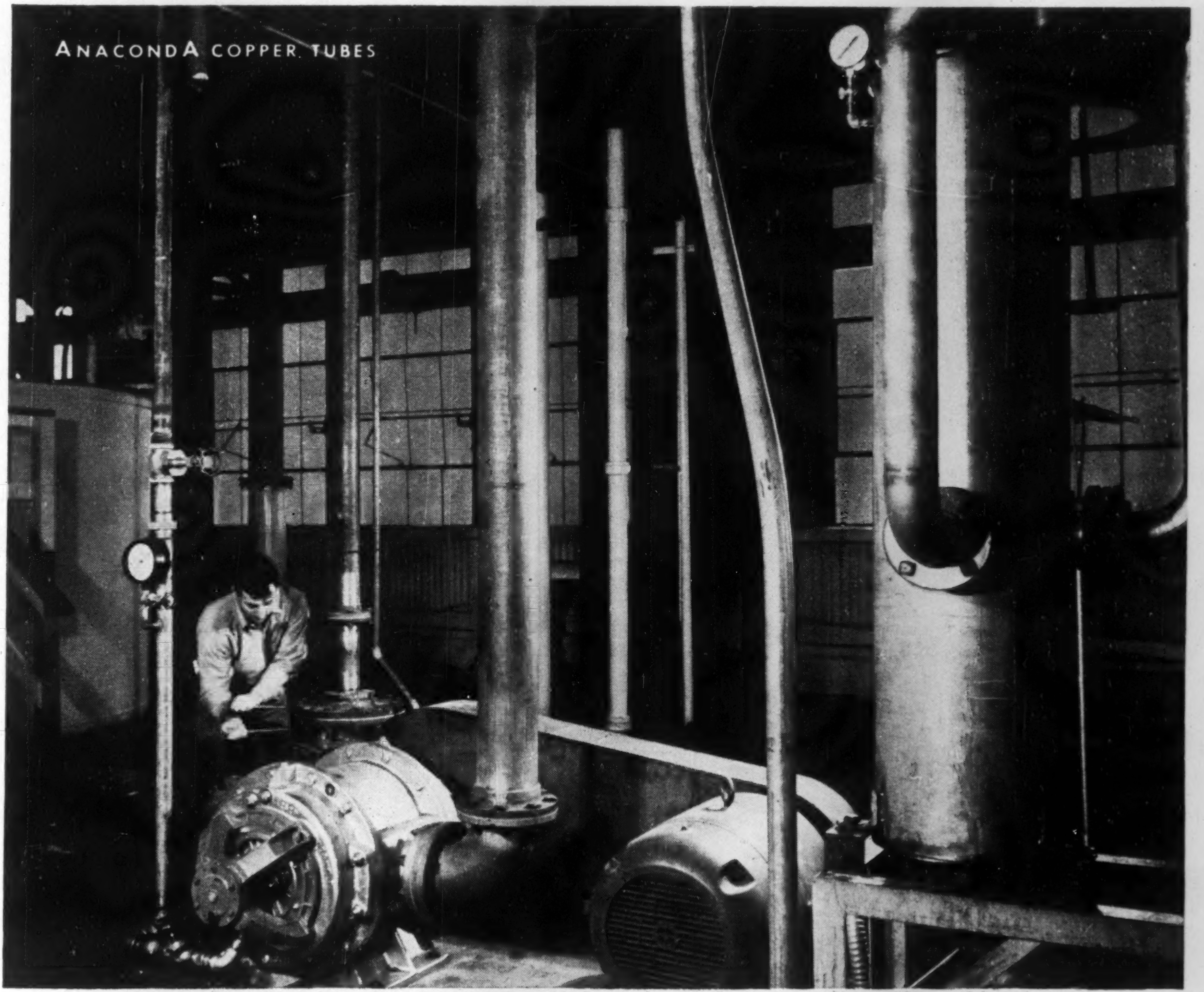
Write for Bulletin and name of nearest Wheeler-Economy representative.

APPROVED UL FM

WE-402

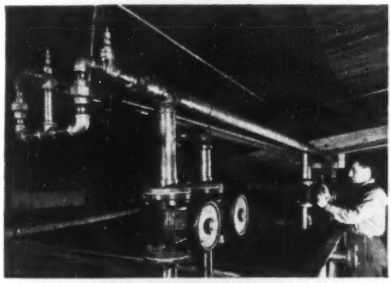
WHEELER-ECONOMY PUMPS

ECONOMY PUMPS, INC. · DIVISION OF C. H. WHEELER MANUFACTURING CO.
19TH AND LEHIGH, PHILADELPHIA 32, PA.



THIS VACUUM PUMP is used in the processing of chemicals and pharmaceuticals manufactured by Chas. Pfizer & Co., Inc. 4-in. copper tubes and 6-in. red brass pipe are used for suction and discharge lines.

This plant's piping will last longer –cost less because it's copper



THESE CHEMICAL PROCESS LINES of 1½-in. and 2-in. copper tubes in the Chas. Pfizer & Co., Inc. plant use both copper solder-type and S.P.S. bronze fittings joined by silver-alloy brazing.

NOT ONLY the first cost, but how long it will last and how much it costs to install are the measures of true industrial piping costs.

Where corrosion shortens piping life, where rust and scale form to restrict flow and increase pumping costs, there you should consider copper's corrosion resistance and immunity to rust—properties that endow copper piping with its long life.

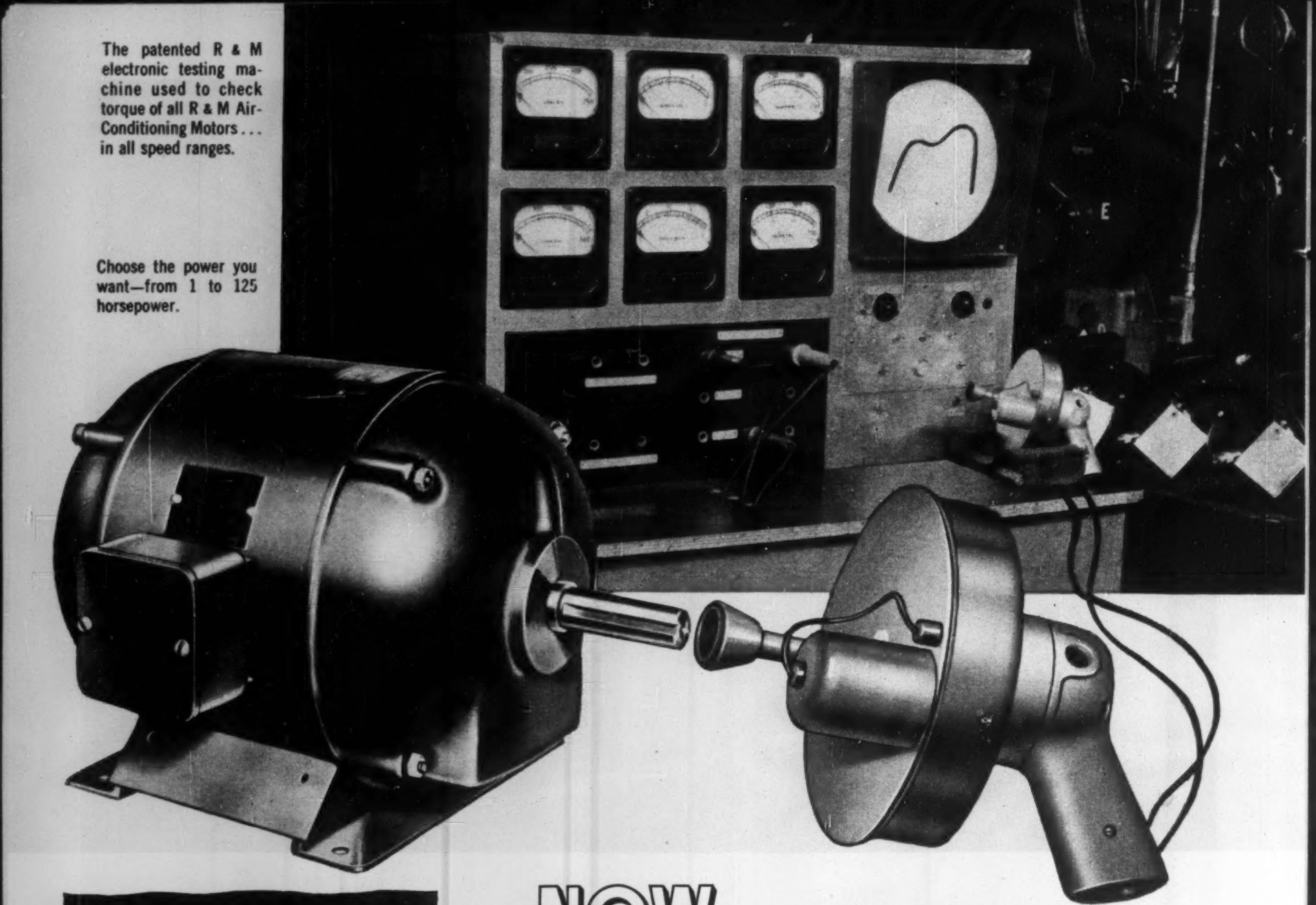
Lightweight copper tubes are far less costly to erect; when used with solder type fittings, they cost far less to install than heavy, threaded pipe. In fact, it is not unusual for labor savings to bring the installed cost of a copper tube, solder fittings system below that of rustable piping.

For examples of the wide use of copper in industrial piping and for detailed information on ANACONDA Copper Tubes and Solder Type Fittings, let us send you a copy of Publication C-24. Write to *The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.* 5336

for copper piping call an

ANACONDA®

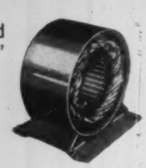
Distributor



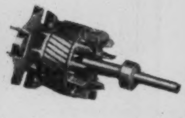
The patented R & M electronic testing machine used to check torque of all R & M Air-Conditioning Motors . . . in all speed ranges.

Choose the power you want—from 1 to 125 horsepower.

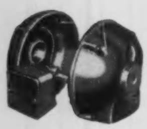
"Weatherized" inside and out— AT NO EXTRA COST!



Steel parts undercoated with baked-on "Robbinite."



Rotor and shaft assembly sprayed with special rust inhibitor.



Cast-iron parts get special anti-corrosion treatment.

Terminal box—cast-iron—gasketed; leads sealed. Repellent grease keeps moisture out of bearings.

NOW . . . get the torque YOU want . . . by specifying ROBBINS & MYERS!

R & M motors have not only the right construction features for air-conditioning service, but the right *torque characteristics* as well.

That's because we have completely eliminated guesswork in determining the starting and acceleration performance of our induction motors. Tested by a unique electronic machine over the entire speed range, each motor *shows* its own *complete* accelerating curve, including that part which is almost impossible to obtain by other methods.

For you, this means your R & M motor will not "hang up" at some low speed—the "dips" have been designed out. And this patented speed-torque tester proves it!

And, here's something you'll want to know about *installation.* You can reconnect—*on the job*—all R & M standard 220/440 volt motors for 220 volt part-winding increment starting. Thus, only half normal starting current is drawn—without need for autotransformers or resistors.

Want more details? Write for Bulletin 400HP, showing all the advanced construction features of R & M motors. It costs you nothing, of course, to find out about the finest air-conditioning motor your money can buy!

ROBBINS & MYERS, INC.

MOTOR DIVISION · SPRINGFIELD, OHIO · BRANTFORD, ONTARIO

Fractional & Integral H.P. Motors & Generators

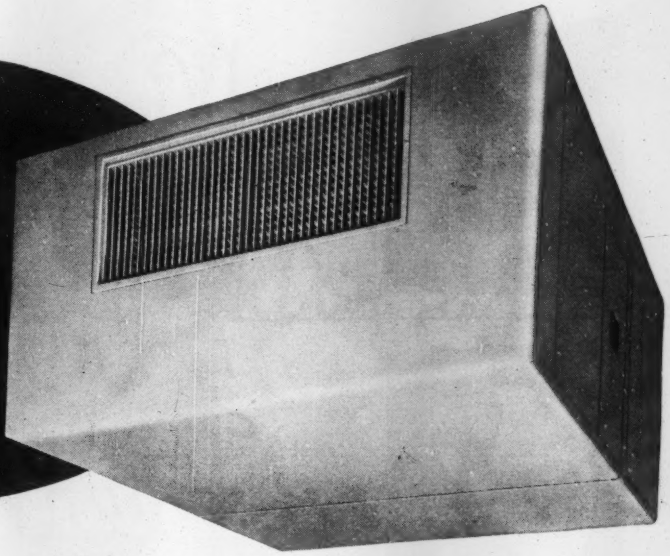
Moyno Pumps

Propellair Industrial Ventilating Equipment

Electric Fans

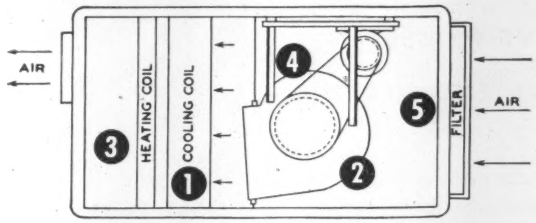
Electric & Hand Hoists & Cranes

NEW FEATURES of PROVEN MERIT



KRAMER

AIR CONDITIONING UNITS



① MUGGY-AIR-CONTROL

It "squeezes" extra moisture from the air on muggy days without reheating, dampers or excessive cooling. No short cycling and uncomfortable conditions.

② "BLOW-THROUGH" DESIGN

Fan-motor assembly always exposed to normal room temperatures. A unique design with many advantages, resulting in —

No motor overload and no loss of bearing lubricant from hot air of the heating coils.

No corrosion of fan-scroll assembly from moisture carry-over of the cooling coils.

③ ANTI-SWEAT CONSTRUCTION

Only a small portion of the casing is exposed to cooled air; that section is heavily insulated.

Access doors and grille have scientific anti-sweat designs.

④ QUIET OPERATION

The fans and motor form an integrated assembly independently rubber-mounted to the casing. All moving parts are completely isolated by rubber.

⑤ FOR FINISHED INTERIORS

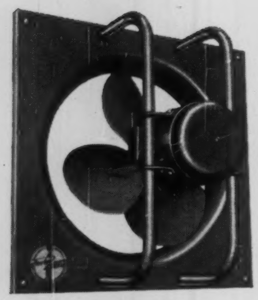
Graceful lines with no unsightly belts, motor and guards exposed to view. Finished in hammer gray enamel.

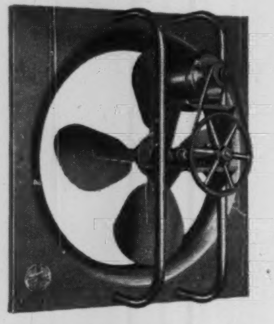
MANY OTHER OUTSTANDING FEATURES.

WRITE FOR BULLETIN AC-238

KRAMER TRENTON CO. • Trenton 5, N.J.

No one but Peerless GIVES YOU SO MUCH





IMMEDIATE DELIVERY

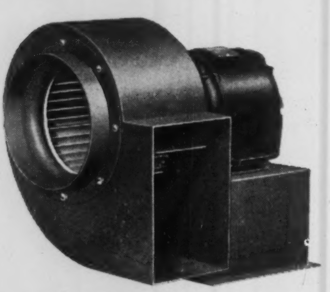
COMPETITIVE PRICES

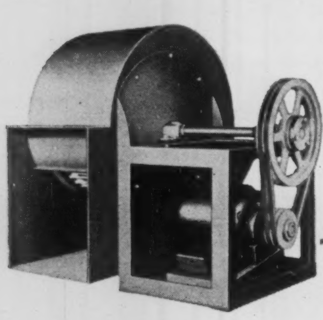
ON-THE-JOB ENGINEERING

If competition's getting tough, you need the kind of service and products that Peerless—and **ONLY PEERLESS**—offers. You want fast deliveries—OK, you get them immediately on any fan or blower in the big Peerless line. You want prices—OK, you get them from Peerless because Peerless builds the entire unit, determines its own prices, pegs prices and holds them. You want engineering help—OK, you get it at no cost from Peerless simply by asking for it, and if necessary, Peerless flies an engineer to your office. You want to eliminate call backs—OK, you do it with Peerless because you get rugged construction, sound engineering and guaranteed motors that are built and job-matched by Peerless for the specific fans and blowers they power.

Peerless gives you everything you need: iron-clad guarantees—and product registrations that permit you to order replacement parts by number.

Check and see, compare and prove that you buy best, sell best, install best and are served best when you deal with the fan and blower manufacturer that offers you most—Peerless Electric.





FAN AND BLOWER DIVISION

Peerless Electric

THE PEERLESS ELECTRIC COMPANY
1409 WEST MARKET ST. • WARREN, OHIO

Maid with Dorex Air Recovery

SHE'S the maid who made Springs Mills sheets famous... now working happily in The Springs Cotton Mills' offices at Fort Mill, South Carolina, where Dorex Air Recovery is part of the air conditioning system.

In this newest of several applications for Springs, Dorex converts about 10,000 c.f.m. of used, recirculated air into FRESH AIR. Thus, Air Recovery permits a substantial reduction of outside air requirements for ventilation. So less conditioning and ventilating equipment is needed initially; operating costs are less over the years.

Wherever installed, Dorex Air Recovery saves money. Records of over twenty years' experience and 10,000 installations show that every $100 invested in Dorex Air Recovery should save some $400 on initial equipment. And every $1 spent for Dorex maintenance should return a $4 saving in operating costs.

Let us help you build business with Dorex Air Recovery. Just clip the coupon to your letterhead and mail it today. Connor Engineering Corporation, Danbury, Connecticut.

CONNOR
ENGINEERING
CORPORATION
dorex®
air recovery

CONNOR ENGINEERING CORP.
Dept. A-64, Danbury, Connecticut

Please send me, without obligation, complete information on Dorex Air Recovery.

Name______________________________

Position____________________________

Company___________________________

Street_____________________________

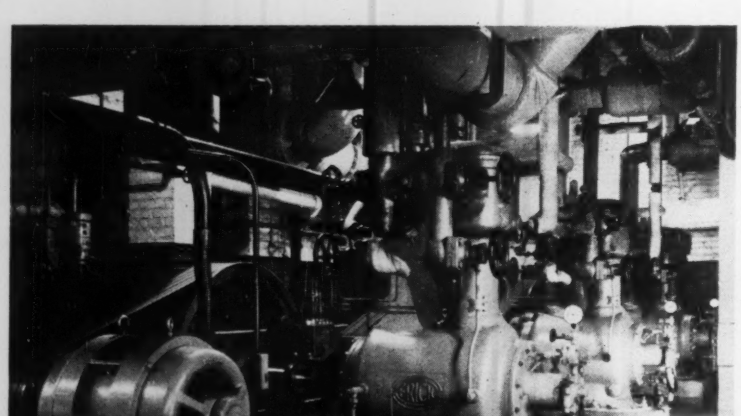
City________________**Zone**____**State**______

Hotel William Penn, Pittsburgh, Is Served Five Ways by —

TRADE **FRICK** MARK®

Refrigeration

These include air conditioning, cooling drinking water, refrigeration of foods, freezer service, and making ice. This magnificent hotel has used Frick equipment since 1936, and finds it both efficient and dependable. Three of the four Frick compressors are shown.



The buildings in which you are interested can likewise profit by using Frick Equipment. We make air conditioning units and central systems; compressors handling Freon-12, ammonia, and other refrigerants; condensers, coolers, coils; freezers, ice makers, ice reserve units; piping, valves, fittings, controls, and special equipment.

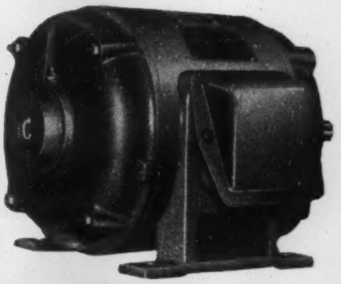
Good territories still available for dealers.

Write, wire, or phone.

DEPENDABLE REFRIGERATION SINCE 1882
FRICK Co.
WAYNESBORO, PENNA. U.S.A.

NEW *Century* Performance-Rated©

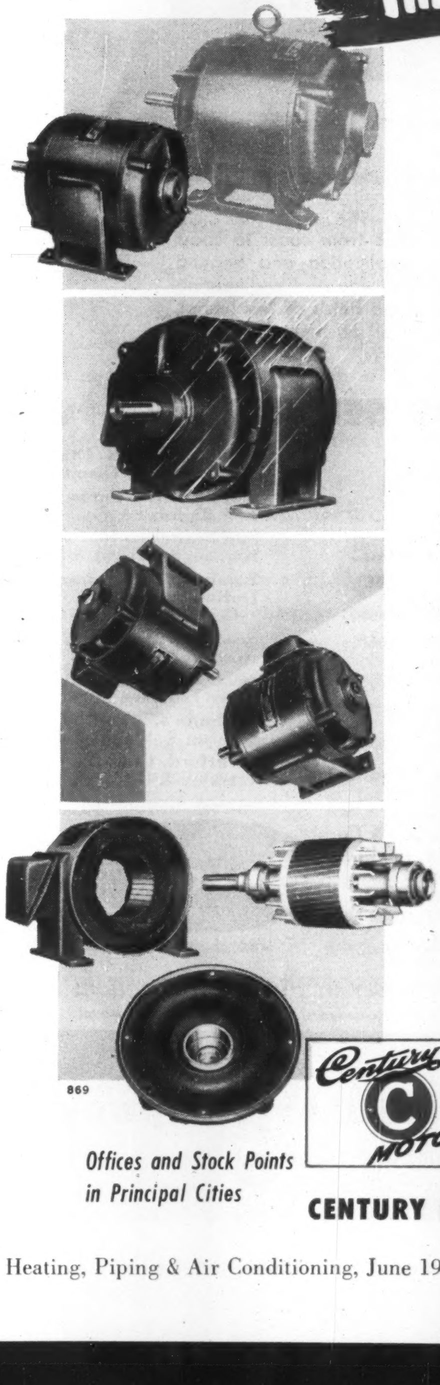
INTEGRAL H.P. MOTORS



Now available in
1 . . . 1½ . . . 2 H.P. sizes—
NEMA frames 182 and 184.

Improved Motors

to match your needs



SMALLER — LIGHTER

More uniform silicon-laminated steel; thinner, *tougher* "Mylar" slot insulation — just two of the many technical developments that help make these new Century Performance Rated Motors so much *smaller* and *lighter*.

BETTER PROTECTION

New concepts of internal motor ventilation permit end bracket and frame design that gives far better protection from falling liquids and solids . . . still maintain 40°C. temperature rise.

MORE FLEXIBLE MOUNTING

You can even have cushion mounting with these new Century Integral H.P. Motors — your choice of sleeve or ball bearings. Ball bearing motors mount vertically, upside down, in any position. End brackets can be rotated for top protection in any position.

EVEN MORE DEPENDABILITY

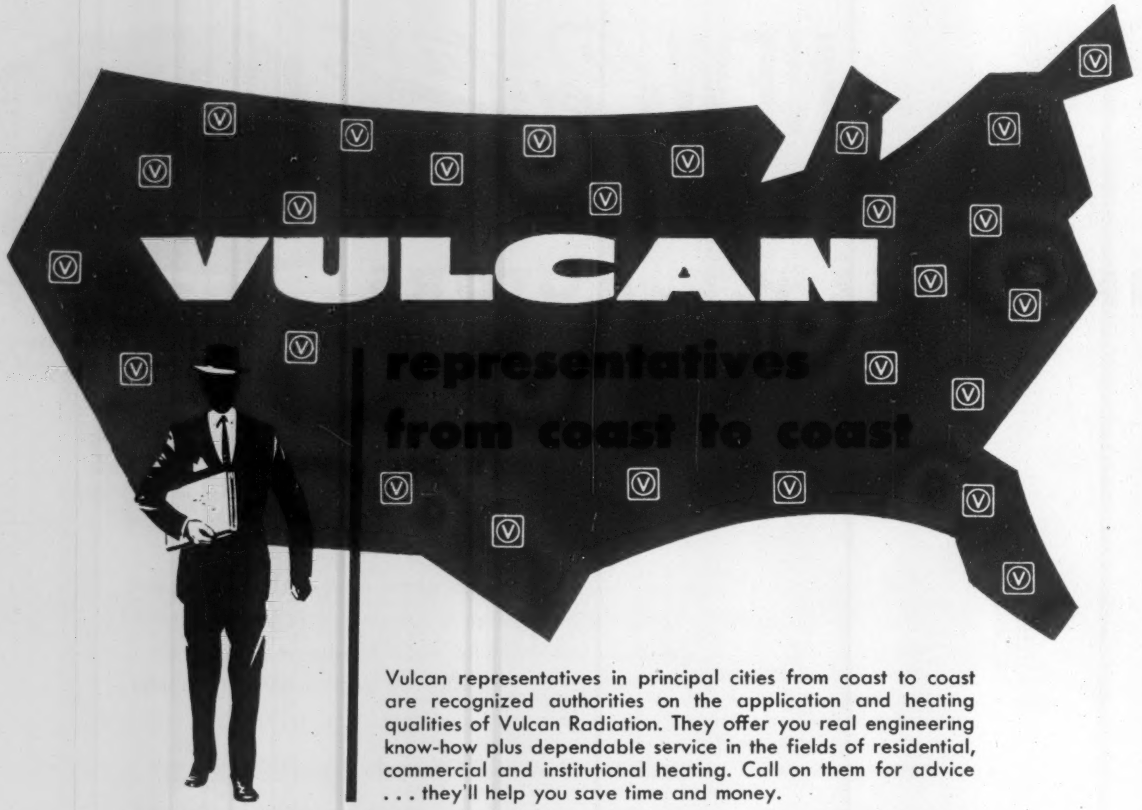
Improved plastic impregnating varnish and plastic insulated magnet wire provide unusual resistance to abrasion, moisture and heat. These new materials possess far better dielectric qualities. Die cast aluminum rotors are individually, dynamically balanced to assure freedom from vibration.

Century C Motors

Specify CENTURY Performance Rated motors for your equipment. Call a Century District Sales Office or your nearest Century Authorized Distributor.

Offices and Stock Points in Principal Cities

CENTURY ELECTRIC COMPANY • 1806 Pine Street • St. Louis 3, Missouri



Vulcan representatives in principal cities from coast to coast are recognized authorities on the application and heating qualities of Vulcan Radiation. They offer you real engineering know-how plus dependable service in the fields of residential, commercial and institutional heating. Call on them for advice . . . they'll help you save time and money.

DEPENDABLE NATIONWIDE SERVICE

Albany, N. Y.
G. W. Heacock & Co., Inc.
Albuquerque, N. M.
Boyd Engineering Co.
Atlanta, Ga.
John A. Dodd Company
Birmingham 5, Ala.
Hugh C. Boisclair
Boston 15, Mass.
C. R. Swaney Company
Buffalo 2, N. Y.
Planned Air Equipment Sales Inc.
Charlotte 1, N. C.
Kirk Cousart & Assocs.
Chicago 6, Ill.
Roy O. Nelson Company
Cincinnati 2, Ohio
Harry A. Pillen
Cleveland 6, Ohio
William G. Jewett
Corpus Christi, Texas
J. R. Dowdell & Co.
Dallas 1, Texas
J. R. Dowdell & Co.
Denver 2, Colorado
Appleton Engineering Co.
Des Moines 9, Iowa
Fred E. Triggs
Detroit 1, Mich.
James A. Hughes
East Orange, N. J.
Parmelee & Hull
El Paso, Texas
Boyd Eng. Co., Inc.
Falls Church, Va.
Charles W. Campbell
Houston, Texas
J. R. Dowdell & Co.
Indianapolis 4, Ind.
Jackson Engineering Co.
Jacksonville 7, Fla.
George A. Israel Co.
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Charles F. Sexton
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Norman S. Wright & Co.
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Fletcher Sales Company
Lubbock, Texas
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Uhl Company
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W. M. Walterskirchen
New Orleans 20, La.
Walter E. Evans & Co.
New York 17, N. Y.
Yocum & Goode, Inc.
Omaha 2, Neb.
D. E. McCulley Co.
Philadelphia 7, Penna.
P. A. Cavanagh Co.
Phoenix, Arizona
Norman S. Wright & Co.
Pittsburgh 15, Penna.
George C. Bickell
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Norman S. Wright & Co.
Richmond 21, Va.
Robert S. Lovelace
Salt Lake City 4, Utah
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San Antonio, Texas
J. R. Dowdell & Co.
San Francisco 10, Calif.
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Scranton 10, Penna.
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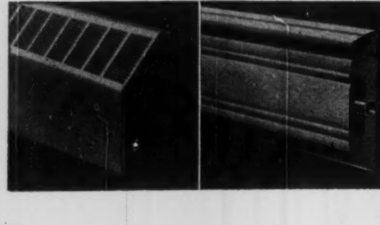
Clarkson & Ostberg

In the long run
VULCAN
costs less

*Trade Mark Reg.

Over twenty-nine years a leader in Fin-tube Radiation.
Also made in Canada under trade name of Heal Radiation by Vapor Car Heating of Montreal

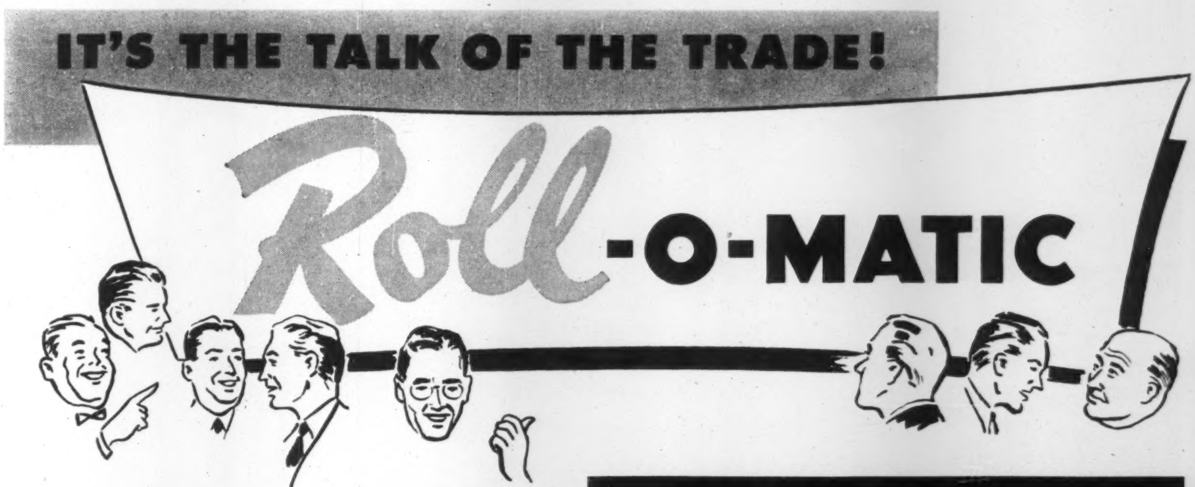
Vulcan Linovector* **(commercial)**
Vulcan TRIMLINE* **(residential)**



The VULCAN Radiator Company
26 Francis Avenue, Hartford, Connecticut

IT'S THE TALK OF THE TRADE!

Roll-O-MATIC

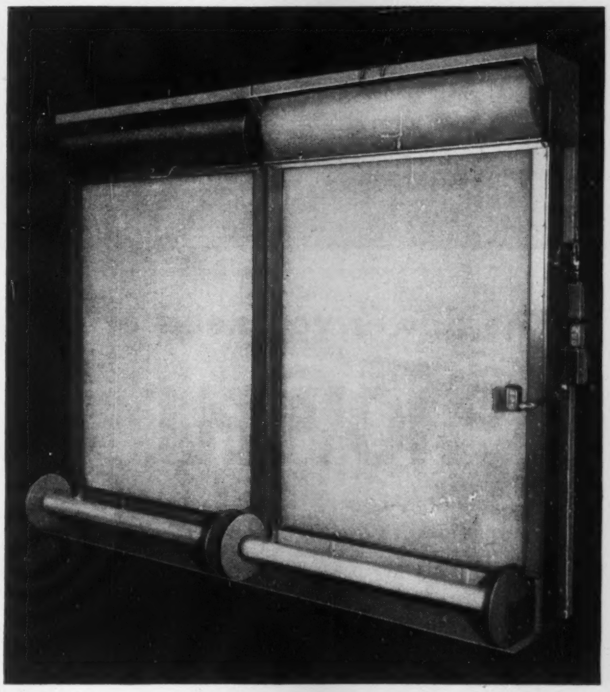


The air filter that renews its media automatically for continuous high efficiency and "rock-bottom" maintenance costs

Here's the most self-sufficient air filter ever designed. It's the new ROLL-O-MATIC—an automatic, renewable media air filter that checks and maintains its efficiency for weeks and months without that first visit from the maintenance crew.

ROLL-O-MATIC is a viscous filter utilizing a low cost filtering media consisting of a 2″ thick mat of glass fibre material sprayed with a nonflammable fluid-jell adhesive. The media, mounted at top of filter in roll form, moves as a continuous curtain down the face of the ROLL-O-MATIC and is rerolled on motor-driven spool at bottom. A pressure differential switch or a synchronous timer regulates movement of the filter curtain so that media usage is in direct proportion to the dust content of the air.

What is the life expectancy of the ROLL-O-MATIC media? Under normal operating conditions, one roll should last one year per 10,000 cfm of capacity. But you can't lose—regardless of amount used, your media cost will still be less than that of throw-away filters.



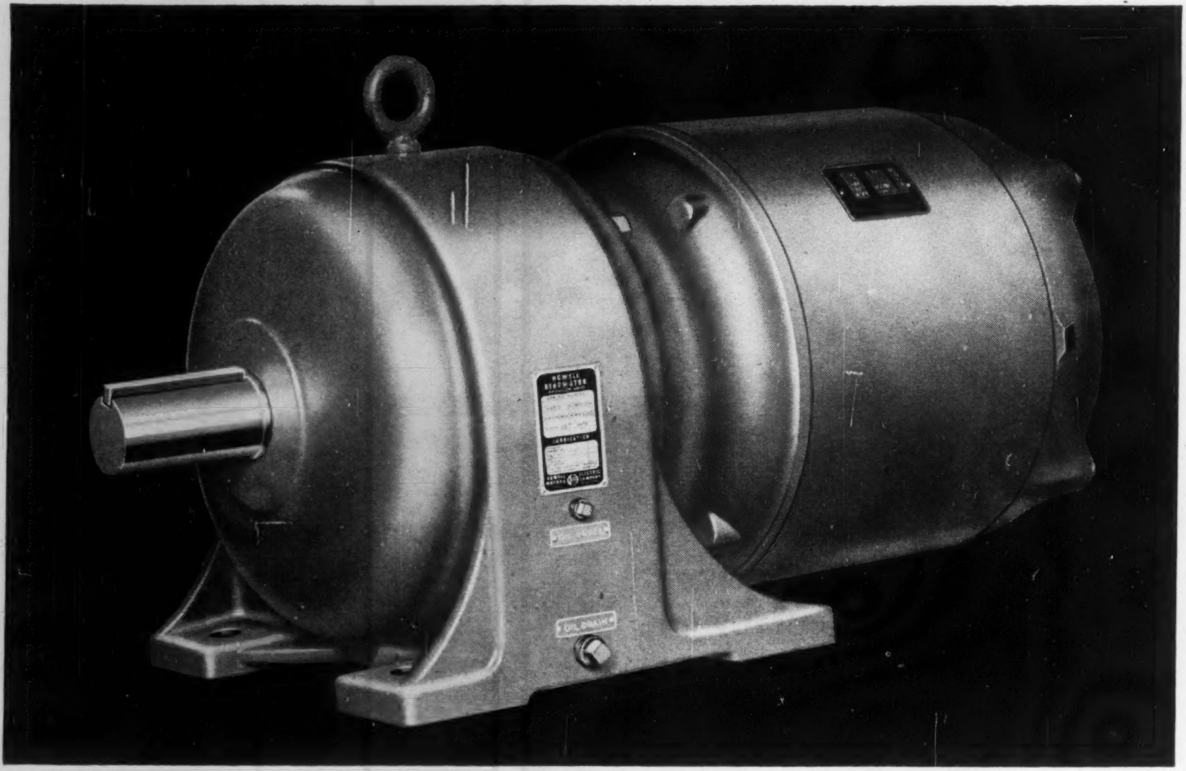
A ROLL-O-MATIC Filter of two 5′0″ wide by 8′0″ high sections—capacity 26,700 cfm.

Simplicity of ROLL-O-MATIC's design and operation offers other dividends, too, in the form of lighter weight, low installation cost and elimination of all water and drain connections. Call your local AAF representative for complete information, now, or write direct for Bulletin No. 248.

AAF American Air Filter

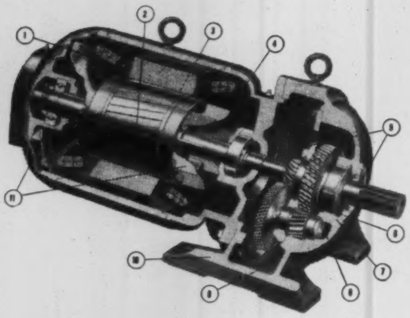
COMPANY, INC.

American Air Filter of Canada, Ltd., Montreal, P. Q. • 373 Central Avenue, Louisville 8, Kentucky



The power you need at the speed you need it . . .

HOWELL GEAR MOTORS



11 reasons why Howell Gear Motors last longer, serve you better

1. High-quality insulation
2. Copper-clad rotor
3. Expert craftsmanship
4. High-quality coil varnish
5. Leakproof oil seals
6. Duti-Rated Lifetime Gearing
7. Unit case construction with integral bearing housings
8. Corner-mounted offset shaft
9. Large oil reservoir
10. Heavy, cast-iron construction
11. Superior cooling

New dependability, greater starting torque and top efficiency, with output speeds as low as 7.5 rpm. are now available in Howell Gear Motors.

This compact, single-unit motor may well be the answer to your gear reduction problems. Combining the finest in heavy duty industrial gearing with the best in motoring, Howell Gear Motors reduce drive failures and production downtime.

Howell Gear Motors use duti-rated, lifetime gearing, with file-hard tooth surfaces and tough, resilient cores. They are available in all types of enclosures, from 7.5 to 780 rpm. with a capacity range from 1 to 30 hp., in all three AGMA service classifications.

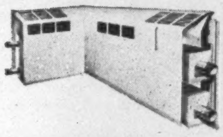
For full information on Howell Gear Motors, contact the Howell man in your area, or write the factory direct for Bulletin GM-1.

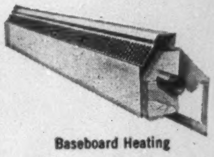
HOWELL Red Band MOTORS

HOWELL MOTORS

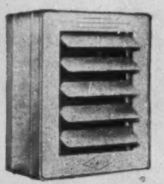
HOWELL ELECTRIC MOTORS COMPANY, HOWELL, MICHIGAN

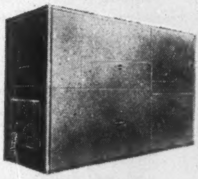
MOTORS FOR INDUSTRY SINCE 1915

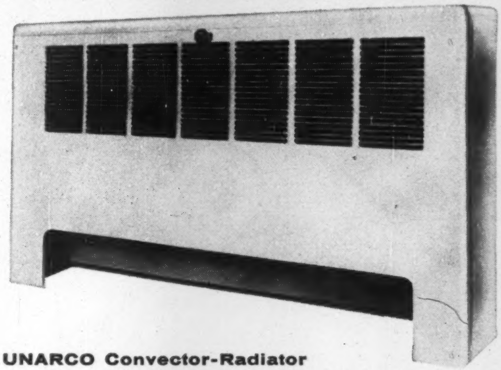

Wall Radiation


Baseboard Heating

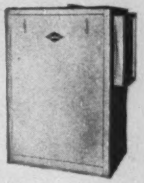
Down Blow Unit Heaters

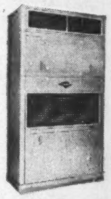

Horizontal Unit Heaters

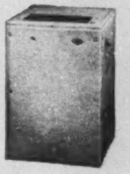

Model AEC Air Conditioners
with self-contained water saver


UNARCO Convector-Radiator

- Snap-on front panel • easy-to-clean • Knock-out end panels for easy installation • Cast bronze headers for added heat transmission
- 18-gauge steel front and top • Directional die-formed louvers
- Simple damper control • Carefully rounded corners for safety
- Attractive modern design
- Ideal for homes, offices, institutions, industrial and commercial uses


Furnace Air Conditioners


Highboy Air Conditioners


Mobile Air Conditioners

year 'round weather conditioning*

UNARCO®

World's finest heating and cooling products in a complete range of types and sizes

- Priced to sell
- 36 sales offices

Get the **UNARCO** facts before you buy

*Trade Mark

UNION ASBESTOS & RUBBER COMPANY
332 South Michigan Blvd. • Chicago 4, Illinois

Gentlemen:
Without obligation, please send illustrated literature on the following units:

☐ Convector-Radiators
☐ Baseboard Heating
☐ Wall Radiation
☐ Horizontal Unit Heaters
☐ Down Blow Unit Heaters
☐ Highboy Air Conditioners
☐ Furnace Air Conditioners
☐ Mobile Air Conditioners
☐ Model AEC Air Conditioners with self-contained water saver

Please have representative call ☐

Name____________________

Position____________________

Firm____________________

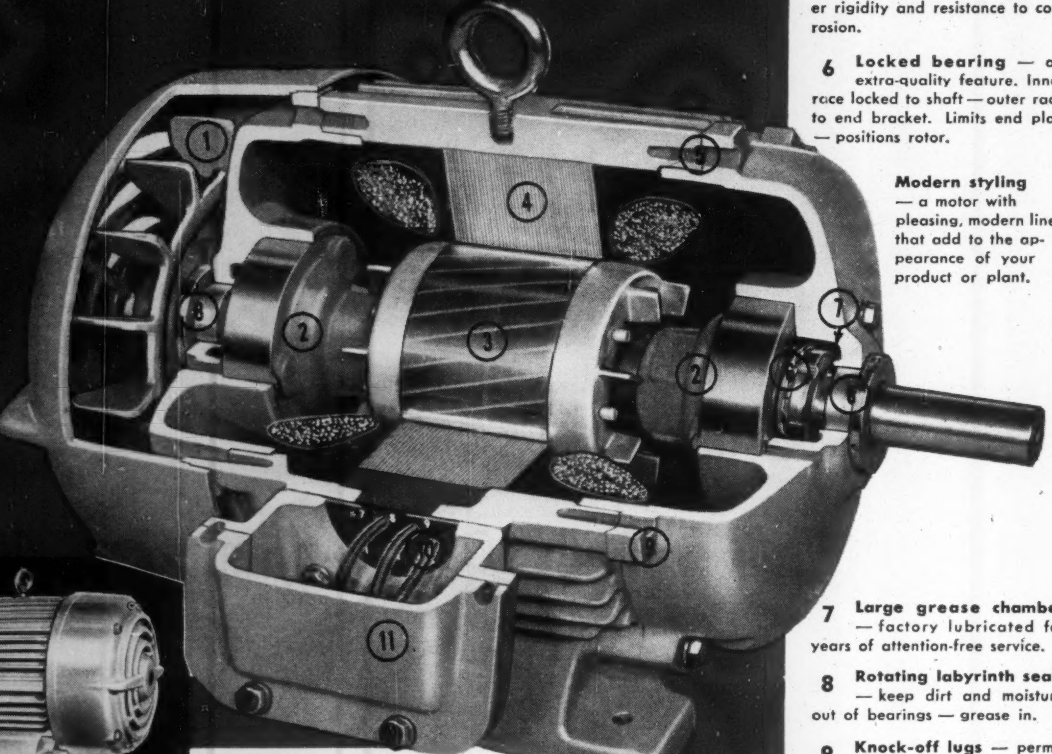
Street____________________

City__________County________State________

UNION ASBESTOS AND RUBBER COMPANY

332 South Michigan Blvd. • Chicago 4, Illinois

Here's the inside story of
the NEW L.A. *Line*
...your BEST enclosed and explosion-proof motor BUY



Cutaway view of explosion-proof motor

1 Fan — efficient, non-sparking fan. New aerodynamic design for more effective cooling.

2 Inner bearing cartridges — lock bearings to end bracket and form explosion-quenching seal along shaft.

3 Indestructible cast-aluminum rotor—dynamically balanced with fan for smooth, quiet operation.

4 Stator — prewound stator core utilizes Formvar wire insulated with a new Alkyd Asphalt Resin insulating varnish.

5 End bracket and housing —heavy cast iron for greater rigidity and resistance to corrosion.

6 Locked bearing — an extra-quality feature. Inner race locked to shaft — outer race to end bracket. Limits end play — positions rotor.

Modern styling — a motor with pleasing, modern lines that add to the appearance of your product or plant.

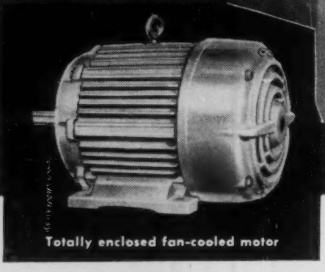
7 Large grease chamber — factory lubricated for years of attention-free service.

8 Rotating labyrinth seals — keep dirt and moisture out of bearings — grease in.

9 Knock-off lugs — permit easy disassembly of motor.

10 Lead identification—permanent, positive lead identification spacer in conduit box.

11 New split conduit box — rugged cast-iron conduit box diagonally split for easy connection.



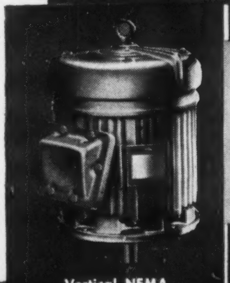
Totally enclosed fan-cooled motor

This is the completely new L.A. totally enclosed fan-cooled and explosion-proof motor. Every feature in this new line is designed for easier installation, longer service life, less maintenance and attention. You get the full benefit of the new NEMA standards in a smaller, more functional, completely modern design.

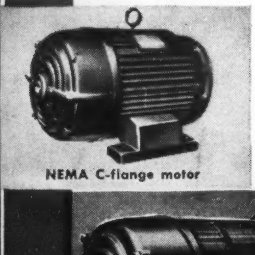
Your nearby Louis Allis Sales Engineer can show you all the reasons why these motors perform better and longer on your tough jobs — why they give you maximum resistance to corrosion wherever you need this extra protection. Call him today.

THE LOUIS ALLIS CO.
MILWAUKEE 7, WISCONSIN

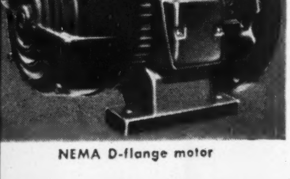
LA-103



Vertical NEMA D-flange motor



NEMA C-flange motor

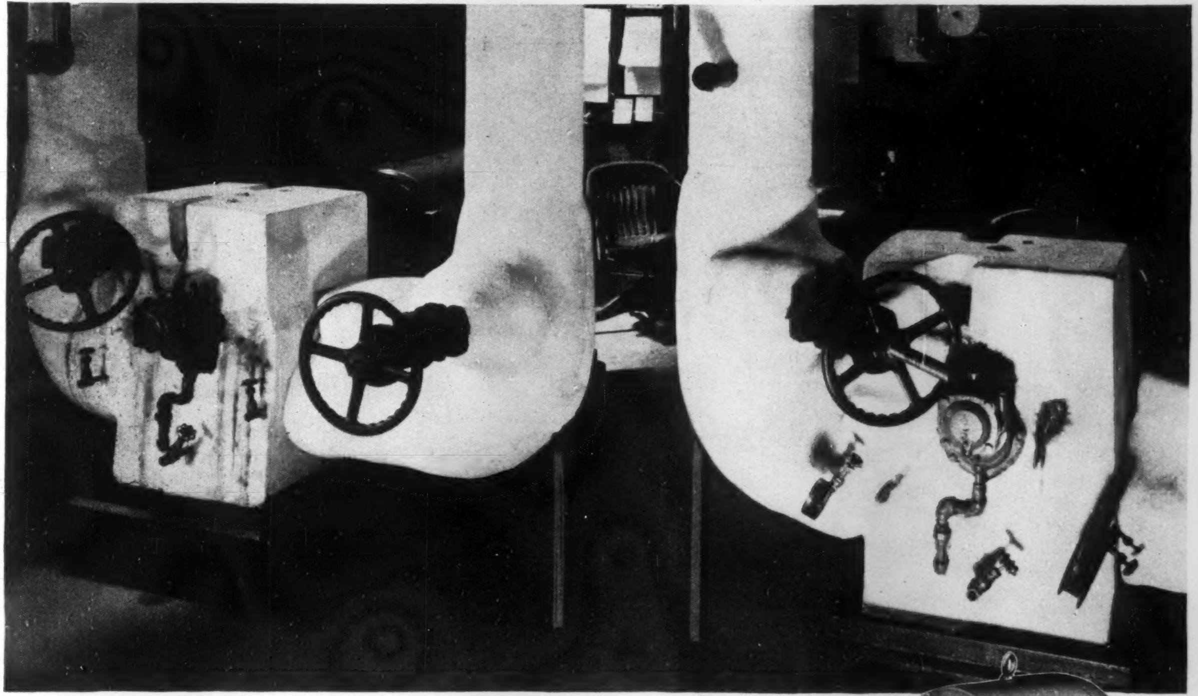


NEMA D-flange motor

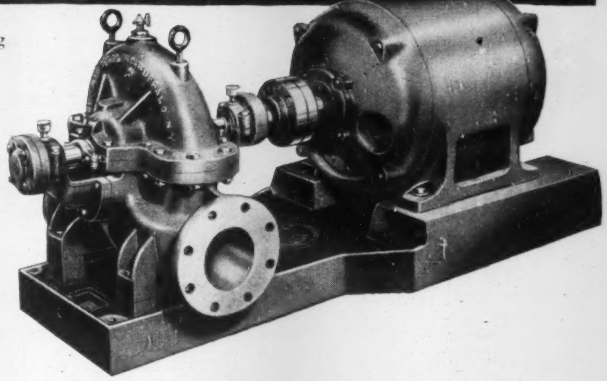
We specialize in SPECIAL MOTORS— *and* PROMPT DELIVERY, TOO

There's a Louis Allis special motor for your toughest application. Whatever electrical or mechanical modifications you need, check first with Louis Allis.

HANDLING CHILLED WATER EFFICIENTLY IN REFRIGERATION and AIR CONDITIONING



Two "Buffalo" Type "SL" Double Suction Pumps Handling Condenser Water In A Large Plant



"BUFFALO" DOUBLE SUCTION PUMPS

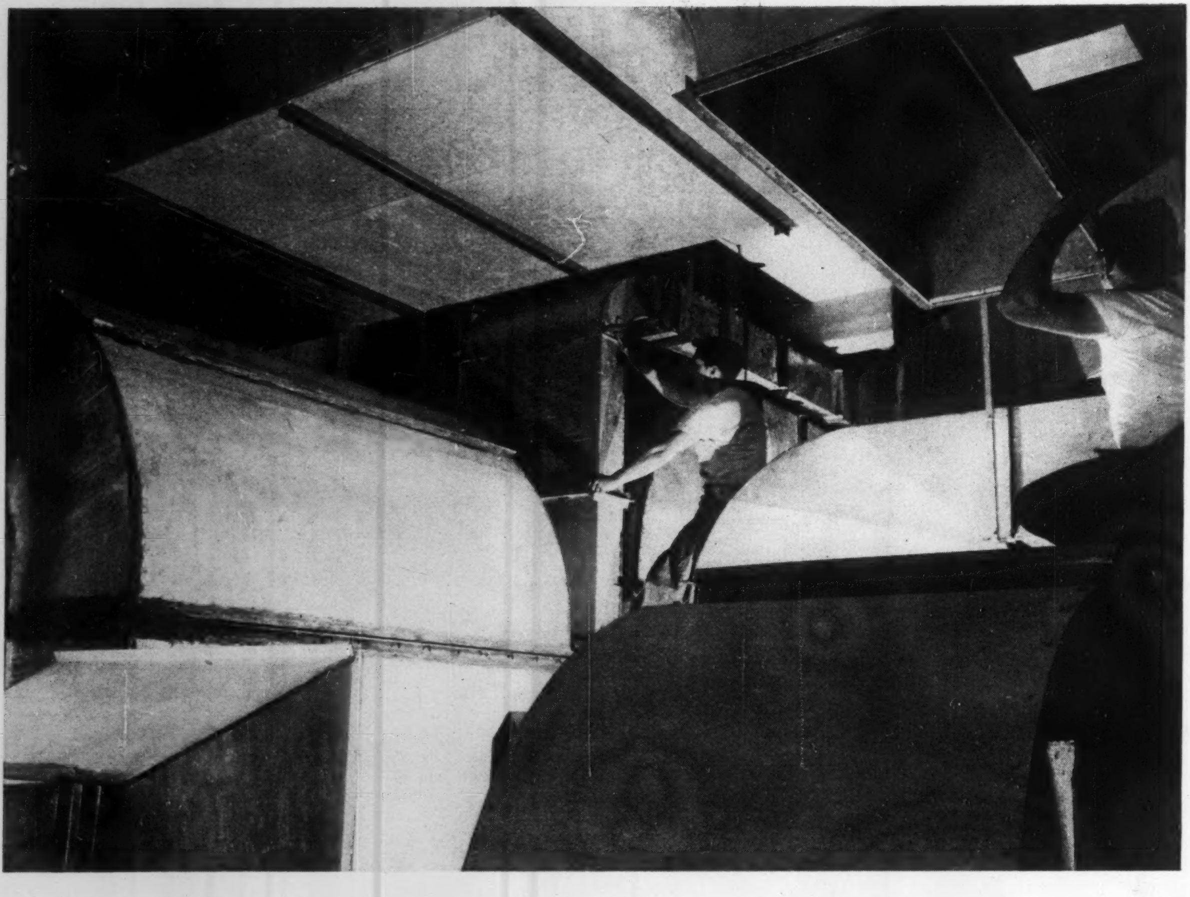
Since your installation can operate no more efficiently than its pumps, these should be specified as carefully as other key equipment. Will these pumps deliver the high volumes required? What about efficiency? Are they easily serviced? How well have these pumps stood up on similar jobs? Here are important questions that determine future satisfaction with the job . . . and "Buffalo" Type "SL" Pumps qualify on all counts. From their high-efficiency enclosed impellers to their rugged horizontally split castings, these proven pumps embody the finest materials, engineering and workmanship to be had. Why not investigate? Write for Bulletin 955-P.

"Buffalo" PUMPS

BUFFALO PUMPS, INC.

171 Mortimer St. Buffalo, New York
Subsidiary of Buffalo Forge Company
Canada Pumps, Ltd., Kitchener, Ont.
Sales Representatives in all Principal Cities.

A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID



Galvanized Steel Costs Less than Sheets of Other Metals

Compare steel with any other sheet metal on the basis of equal strength and you will find that it costs substantially less. To equal the strength or stiffness of light-gage steel, other metals must be used in relatively thick and expensive gages.

If you compare steel with other metals on the basis of equal weight, again you will see that steel is less expensive. Pound for pound, no other commonly used sheet metal can match the low cost of steel.

Bethlehem galvanized sheets are made from strong, durable steel, either plain or copper-bearing. They carry a tight, uniform coating of zinc to provide superior corrosion-resistance. They look good. They have excellent workability, and they give a professional finish to any sheet-metal job.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

***Export Distributor:* Bethlehem Steel Export Corporation**

Bethlehem

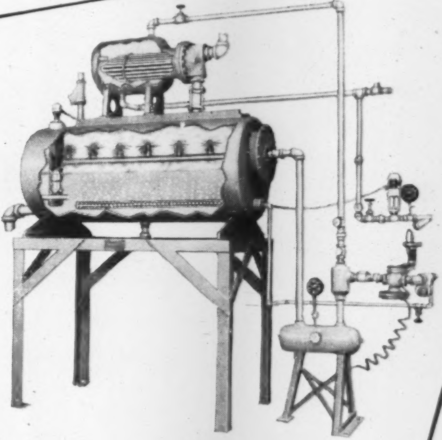
GALVANIZED

Steel Sheets

★ BETHLEHEM STEEL ★

A FRESH LOOK INTO *Deaeration!*

SCHAUB
ZERO-OXYGEN
Deaerators



ENTIRELY NEW

in operating principle
in mechanical design
in the advantages they offer

SCHAUB
ZERO-OXYGEN
Deaerators

a Fresh approach . . . a Major advance in boiler feedwater deaeration

"Newness" for its own sake is no advantage in a deaerator. But when new thinking achieves improved performance not possible with conventional designs, it's worth looking into!

The Schaub Zero-Oxygen Deaerator differs from all others in that it provides *external* pre-heating to a temperature *above* boiling point, with over-atmospheric pressure held only up to the internal sprayer manifold. The storage receiver itself is *fully vented* and operates at constant, safe atmospheric pressure.

This simple but basic difference opens the way to a whole series of better performance characteristics, including:

LOW OPERATING COSTS
LOW MAINTENANCE COSTS
COMPLETE OXYGEN REMOVAL—(to .005 cc/liter)
COMPLETE SAFETY
WIDE RANGE FOR LOAD VARIATIONS
SIMPLER DESIGN AND OPERATION

The "hows" and "whys" of Schaub Zero-Oxygen Deaerators make an important story for any engineer or operating man concerned with boiler feedwater deaeration. Mail the coupon and we'll send it to you.

FRED H. SCHAUB ENGINEERING COMPANY
2116 South Marshall Boulevard • Chicago 23, Illinois

MAIL THE COUPON FOR BULLETIN 575

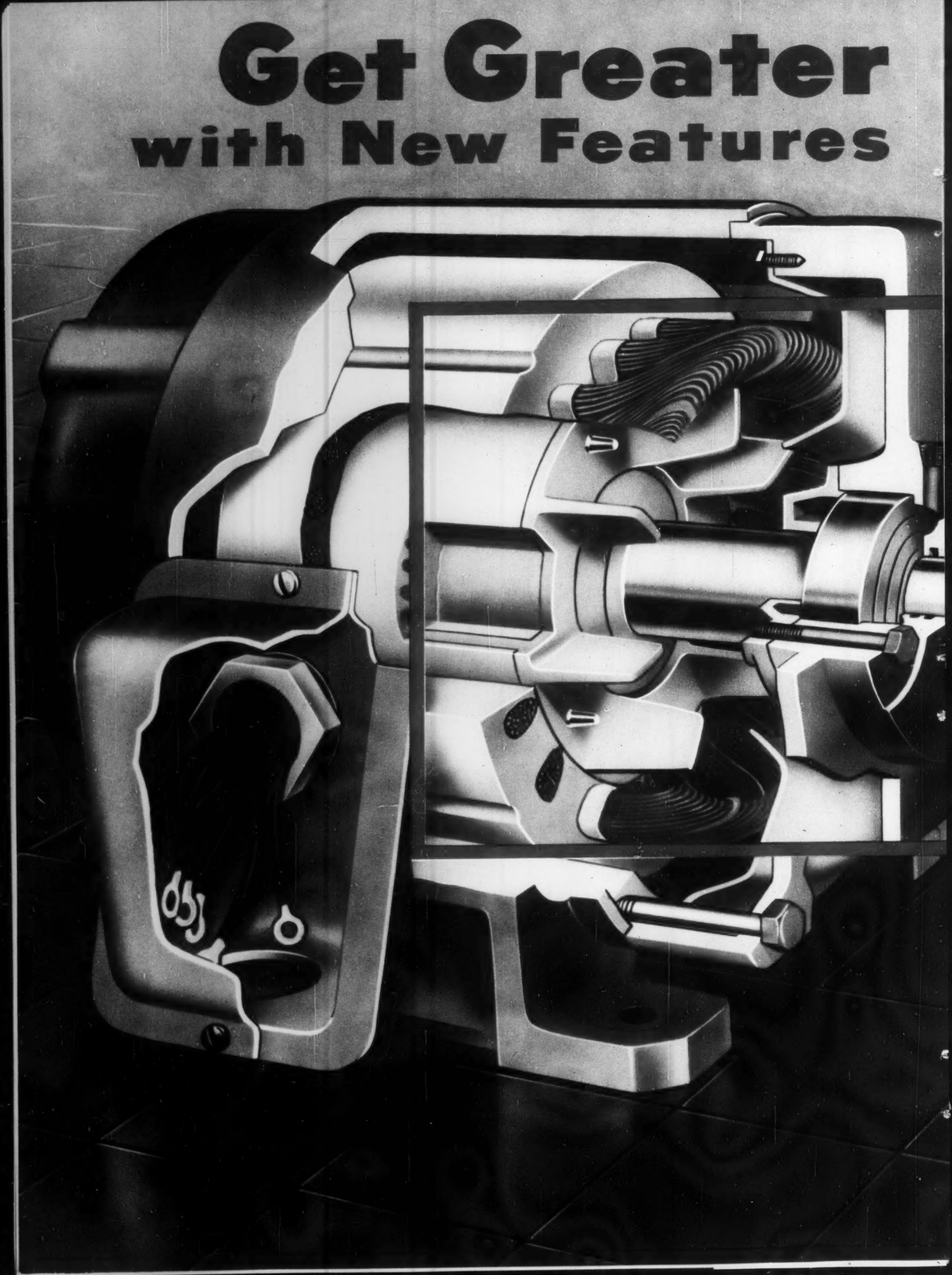
Why a deaerating system? How can it save you money and trouble? What makes a good system? How to get maximum benefits at lowest cost? What are some of the engineering factors involved?

These and many other questions are answered in Schaub Bulletin 575, just off the press. It's a valuable contribution to boiler deaeration theory and practice.

FRED H. SCHAUB ENGINEERING COMPANY
2116 South Marshall Boulevard Chicago 23, Illinois

Please send me, without cost or obligation, my personal copy of your new Bulletin 575 on Boiler Feedwater Deaeration.

NAME...
COMPANY..
ADDRESS..
CITY........................... ZONE.... STATE........

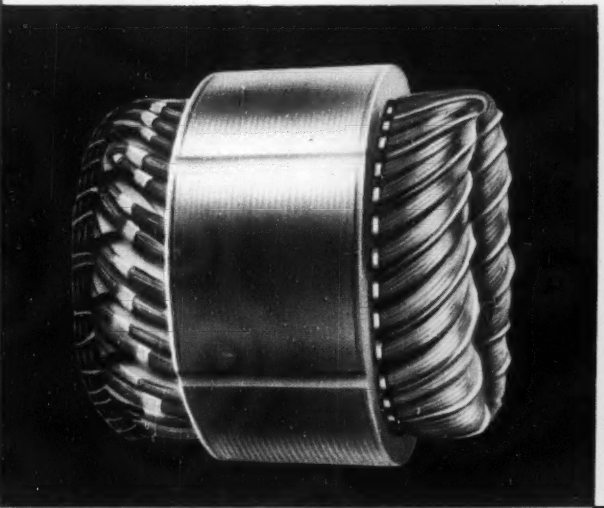

Get Greater
with New Features

Motor Economy
. . . Proved Principles

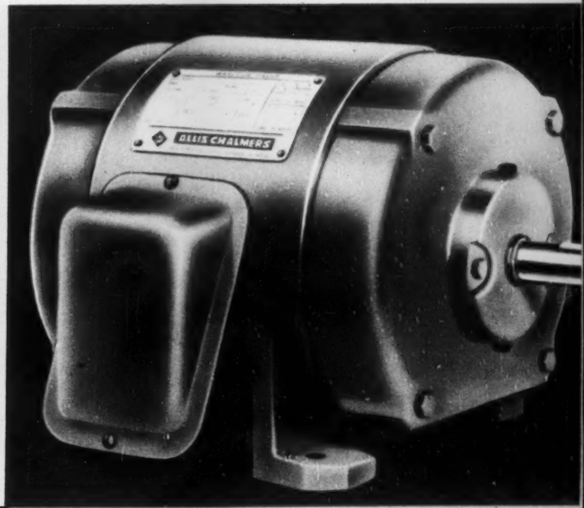
Here's the inside story of a great new motor. It combines the best of the new developments in methods and materials with the best of the tried and proved principles that have made such an outstanding record for Allis-Chalmers motors.

Smaller in size than previous designs, it offers greater protection against damage from falling liquids and solids. The bearing design gives greater bearing protection, ease of maintenance and long life. Insulation gives you famous Allis-Chalmers rugged dependability.

Consult your nearby Allis-Chalmers Authorized Distributor or District Office on your motor needs. Or write for Bulletin 51B6210.



STATOR DOUBLE INSULATED—Stator laminations are welded across back for rigidity. Heavy varnished cambric insulation is inserted between phase windings. Wound stator is dipped several times in special insulating varnish of proved effectiveness and stamina, and baked after each dip. The Allis-Chalmers stator is both physically and electrically strong . . . thoroughly protected against moisture, heat and corrosion.



RIGID CAST-IRON FRAME—Heavy, distortion-free cast-iron frame holds bearings in rigid alignment . . . gives all-around protection against physical damage . . . resists rusting. Air intakes are well protected by being located on the underside of the end housing. There is plenty of room for free air circulation on the back of the stator core for efficient, even cooling. Air is discharged horizontally and to the sides.

Multiple bearing protection keeps grease in . . . keeps dirt out . . . permits relubrication in service

Extreme care has been taken to provide longest possible bearing life and lowest possible maintenance costs. The bearing itself is of double-shielded type, which allows controlled migration of grease in and out of the bearing to suit operating conditions. Yet bearing is protected against greatest cause of bearing trouble — overgreasing.

Close running clearances and double labyrinth seals between the shaft and outer bearing housings keep grease in the bearing and exclude dirt. Grease is kept out of the interior of the motor by a bearing cap with a long running clearance along the shaft. The cap is held tightly in place by hex head cap screws. Large grease chambers hold an ample supply of lubricant.

A-4362

A-C
ALLIS-CHALMERS

ALLIS-CHALMERS

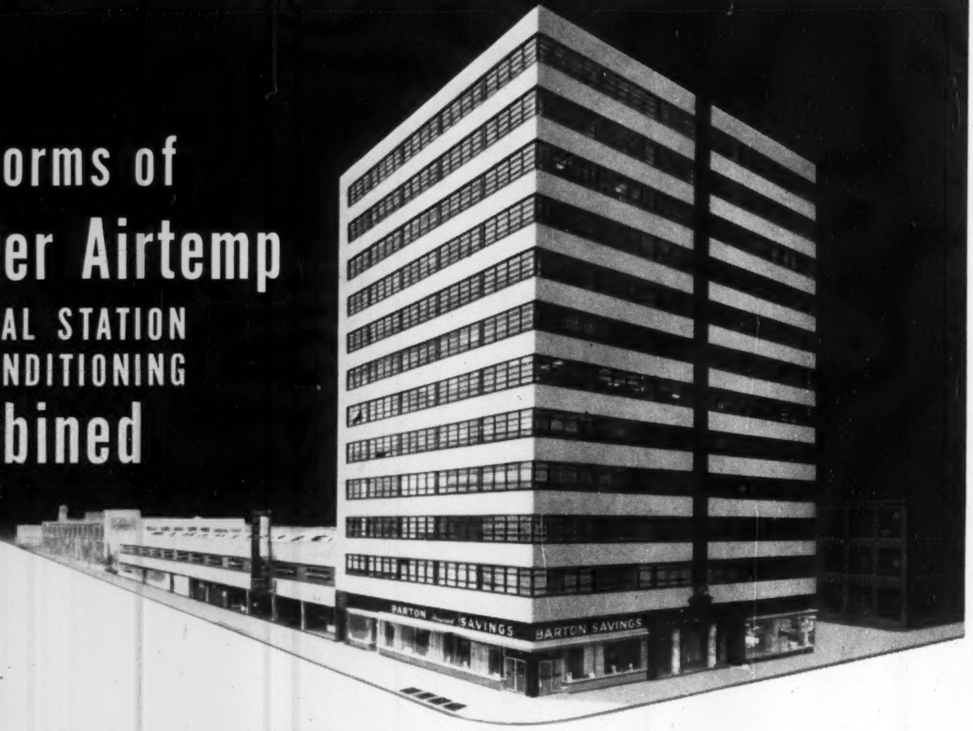
MILWAUKEE 1, WISCONSIN

2 forms of Chrysler Airtemp

CENTRAL STATION

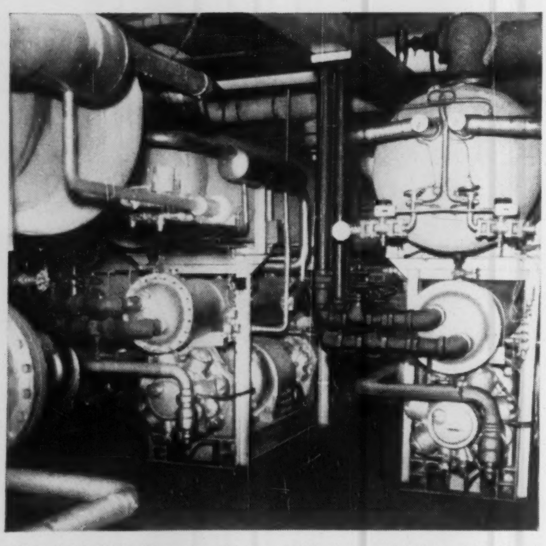
AIR CONDITIONING

combined



provide the most efficient and most economical cooling and heating for Newark's

COMMERCE COURT BUILDING



Five 125 H.P. Chrysler Airtemp "Packaged" Water Chillers provide cooling for Year 'Round Air Conditioning in Commerce Court Building. Heart of each unit is the Chrysler Airtemp Variable Capacity Radial Compressor with exclusive design which reduces compressor weight, saves space. Quiet operation due to perfect balance (no special foundation required!).

In some cases, as in the case of the Commerce Court Building in Newark, N.J., it takes a *combination of two* forms of air conditioning to provide the most efficient and most economical cooling and heating. Here, individual air conditioners of a Chrysler Airtemp Perimeter System serve outside rooms, with chilled water for cooling and warm water for heating piped from a Central Station in the basement. Individual tenants can choose the temperature they want at all times; air conditioning can be shut off completely in any section at any time. Inner areas of each floor are served by a Chrysler Airtemp Central Duct System, with horizontal ducts used to circulate the conditioned air.

Chrysler Airtemp manufactures equipment for every system of modern air conditioning. All of these products are precision-built in a windowless, air conditioned plant. Through Airtemp Construction Corporation, a wholly-owned subsidiary, we offer architects, engineers and contractors a complete air conditioning service. To enlist this service, which can make your job easier, just write Airtemp Division, Chrysler Corporation, Dept. HP, 1600 Webster Street, Dayton 1, Ohio.

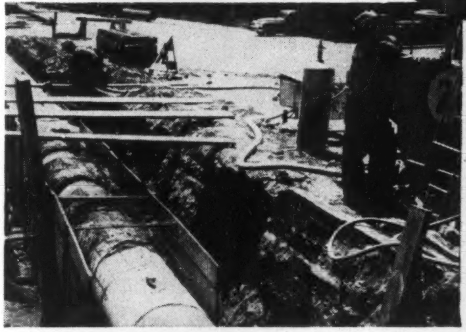
CHRYSLER AIRTEMP

HEATING • AIR CONDITIONING

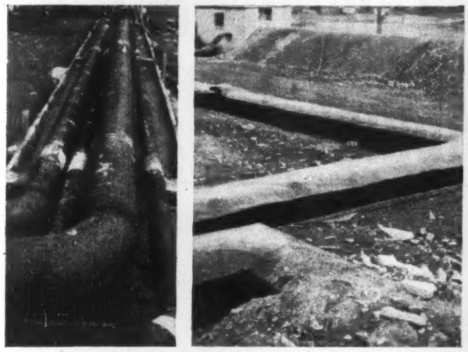
for HOMES, BUSINESS, INDUSTRY

Airtemp Division, Chrysler Corporation, Dayton 1, Ohio

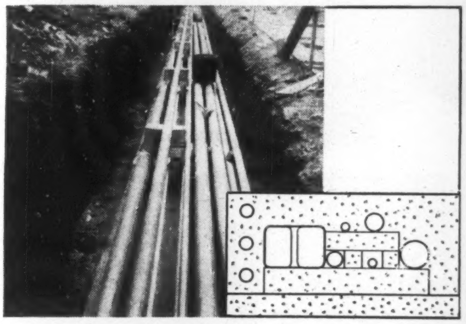
EVEN TOUGH JOBS ARE EASY for "Z-crete"®



No pipe too small or too large to be insulated with Z-crete. Here in city streets a large utility installs a monstrous 30″ low pressure steam supply and 10″ return pipe. Both pipes are contained in a single Z-crete conduit.



A large tank farm pipe assembly insulated with Z-crete on grade. Some of the large Z-crete conduits are used as walkways. On several occasions area has been flooded with no harmful effect on permanent, efficient Z-crete.



In this large hospital area Z-crete effectively insulates the complicated piping system between all buildings. Special support block shapes can be manufactured to meet special needs. Z-crete conduit is in effect a supporting pipe sleeve.

these actual photographs show how Z-crete is solving the toughest job problems

What other insulation for underground piping offers all these superior advantages

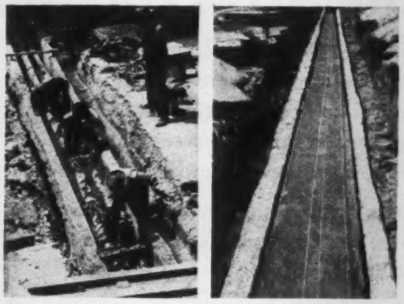
★ **MORE ADAPTABLE**—Z-crete is a field fabrication. Piping contractor has an easy-to-work-on concrete base pad for installing pipe. Pipes are installed—*then* insulated.

★ **MORE ECONOMICAL**—Low in cost, provides permanent and stable insulation. Especially economical in large-pipe or multiple-pipe installations.

★ **MORE EFFICIENT**—Z-crete's monolithic pour eliminates heat loss due to air movement. Six inches of insulation around pipe provides PLUS insulation value.

★ **PERMANENT**—Will not rot or deteriorate...water can't flow through Z-crete. Resilient, completely fire-proof.

★ **READILY AVAILABLE**—Z-crete materials are readily available from our many strategically located plants throughout the United States and Canada. Z-Crete is furnished and installed only by licensed applicators of Zonolite Company under U.S. Patent No. 2355966—Canadian Patent No. 439356. There is an applicator near you.



Many conduits are reinsulated with Z-crete. On this job water had ruined sectional pipe covering insulation. Pictures show before and after reinsulation. (Special pump equipment makes possible reinsulation with minimum of excavation.) It is economical to reinsulate in this manner if piping is good but insulation has deteriorated.

"Z-crete"

DIVISION
Zonolite Company

Write for FREE Booklet

Zonolite Company, Dept. HPA-64
135 S. LaSalle St., Chicago 3, Ill.
Please rush free Z-crete Booklet Z-11 with full details about this easier, better insulation of underground heated piping.

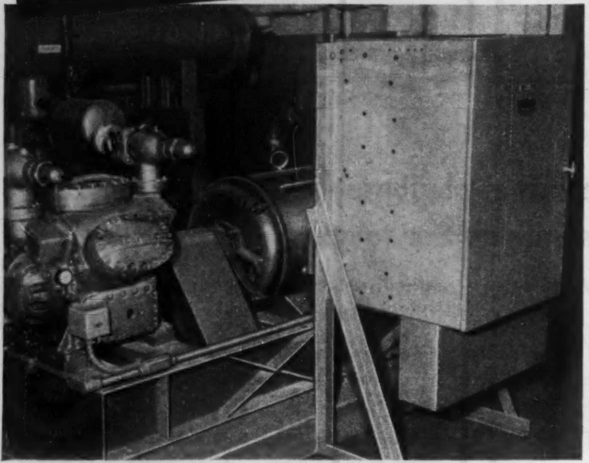
Name..

Address..

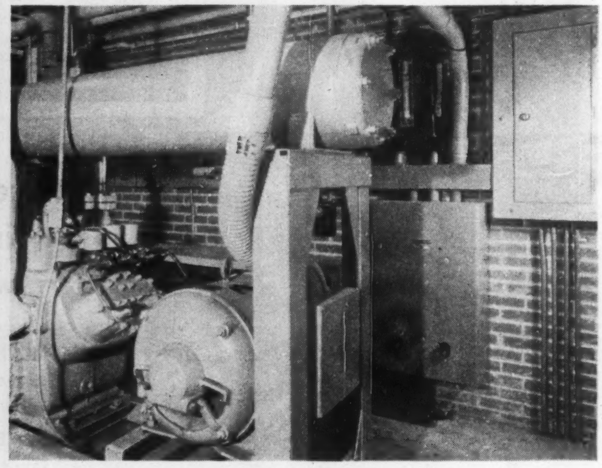
City.............................*Zone*....*State*............

Wagner®
ELECTRIC MOTORS
. . . the choice of leaders in industry

Start Squirrel-Cage Motors THE MODERN WAY



This 100 hp 3 step increment start motor, with double extended shaft, drives two refrigeration compressors in an Atlanta hospital.



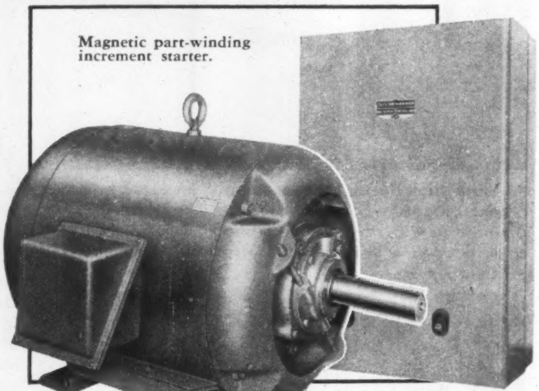
A 40 hp open type high torque motor with an increment starter, drives this compressor in a Houston office building.

with the Wagner Increment Motor and Starter Combination

You benefit when you install a Wagner Increment Motor and Starter "package" because you get a most economical, highly efficient motor and starter combination that limits inrush of motor current to values that are acceptable for the distribution systems of most power companies.

Wagner two-step starter combinations are suitable for most applications. A three-step increment starter is available for applications calling for unusually low inrush of starting current.

Your nearby Wagner engineer will be glad to help you select the combination that meets *your* requirements. Call the nearest of our 32 branch offices, or write us.



Magnetic part-winding increment starter.

Type CP Motor, 1 to 250 hp.

Wagner Electric Corporation
EST. 1891

WAGNER ELECTRIC CORPORATION
6370 PLYMOUTH AVE., ST. LOUIS 14, MO., U.S.A.

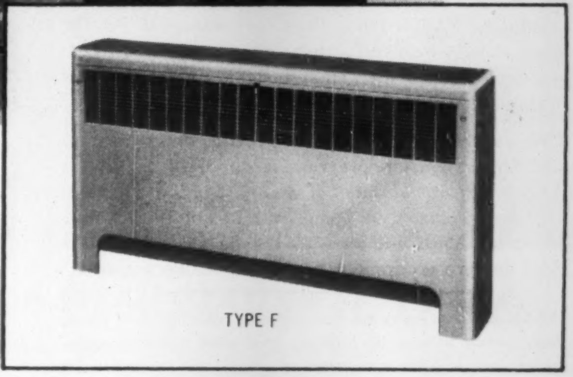
BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

- ELECTRIC MOTORS
- TRANSFORMERS
- INDUSTRIAL BRAKES
- AUTOMOTIVE BRAKE SYSTEMS— AIR AND HYDRAULIC

M54-14

1350 Lakeshore Drive Apartments, Chicago

Loebl, Schlossman & Bennett—Architects
Samuel R. Lewis & Associates—Consulting Engineers
M. J. Holleran—Plumbing & Heating Contractor
S. N. Nielsen Company—General Contractor
Draper & Kramer, Inc.—Managing Agents



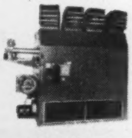
TYPE F

740 ULTRA-MODERN LIVING UNITS COMFORTABLY HEATED

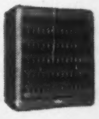
By *Airtherm* CONVECTORS

The clean, modern beauty of Airtherm Convectors fits perfectly into these functional interiors. Outstanding performance and easy maintenance make Airtherm Convectors exceptionally practical for this huge apartment project. To help you solve a wide range of heating problems Airtherm Convectors are available for wall, recessed or free-standing installation.

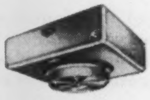
For Heating Satisfaction . . .
Think First of
Airtherm



Oil or Gas Direct Fired Heaters



Horizontal Type Unit Heaters



Vertical Type Unit Heaters

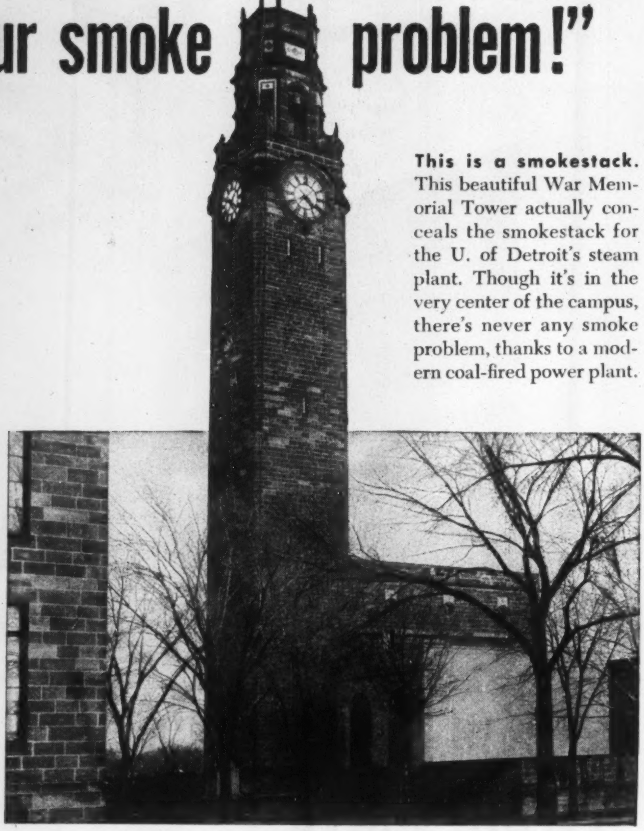
Centrifugal Fan Unit Heaters

Ask Your Wholesaler or Write

AIRTHERM MANUFACTURING COMPANY
711 South Spring Avenue • St. Louis 10, Missouri

"How modern coal equipment saves us $9,000 a year and solves our smoke problem!"

Says Albert E. Unruh,
Chief Engineer
University of Detroit
Detroit, Michigan



This is a smokestack. This beautiful War Memorial Tower actually conceals the smokestack for the U. of Detroit's steam plant. Though it's in the very center of the campus, there's never any smoke problem, thanks to a modern coal-fired power plant.

"Again and again over the last decade, coal burned with modern equipment has proved itself the most flexible, economical fuel for heating our school buildings. We made our first investment in modern coal equipment shortly after the last war. By 'restokering' two existing boilers, we saved $9,000 the first year —actually $2,500 more than we estimated. At the same time, we solved a disturbing smoke and flyash problem and provided enough steam capacity to heat additional new buildings.

"We're completely sold on coal. And when our building expansion program required us to further increase steam production, we again chose a modern coal-fired boiler. Coal has proved its ability to handle increased loads and save us dollars year after year. And modern equipment eliminates smoke nuisance."

Additional case histories, showing how other types of plants have saved money by burning coal with modern equipment, are available upon request.

If you operate a steam plant, you can't afford to ignore these facts!

BITUMINOUS COAL in most places is today's lowest-cost fuel, and coal reserves in America are adequate for *hundreds of years to come.*

COAL production in the U.S.A. is highly mechanized and by far the most efficient in the world.

COAL prices will therefore remain the most stable of all fuels.

COAL is the safest fuel to store and use.

COAL is the fuel that industry counts on more and more—for with modern combustion and handling equipment, the inherent advantages of well-prepared coal net even bigger savings.

If you want to cut steam costs, it will pay you to investigate the advantages of modern coal equipment. For example, you may be able to save as much as 20% on fuel alone by replacing outdated equipment with modern stokers and boilers. Or, a small investment in modern controls and other up-to-date, fuel-conserving devices may boost efficiency of your present operation.

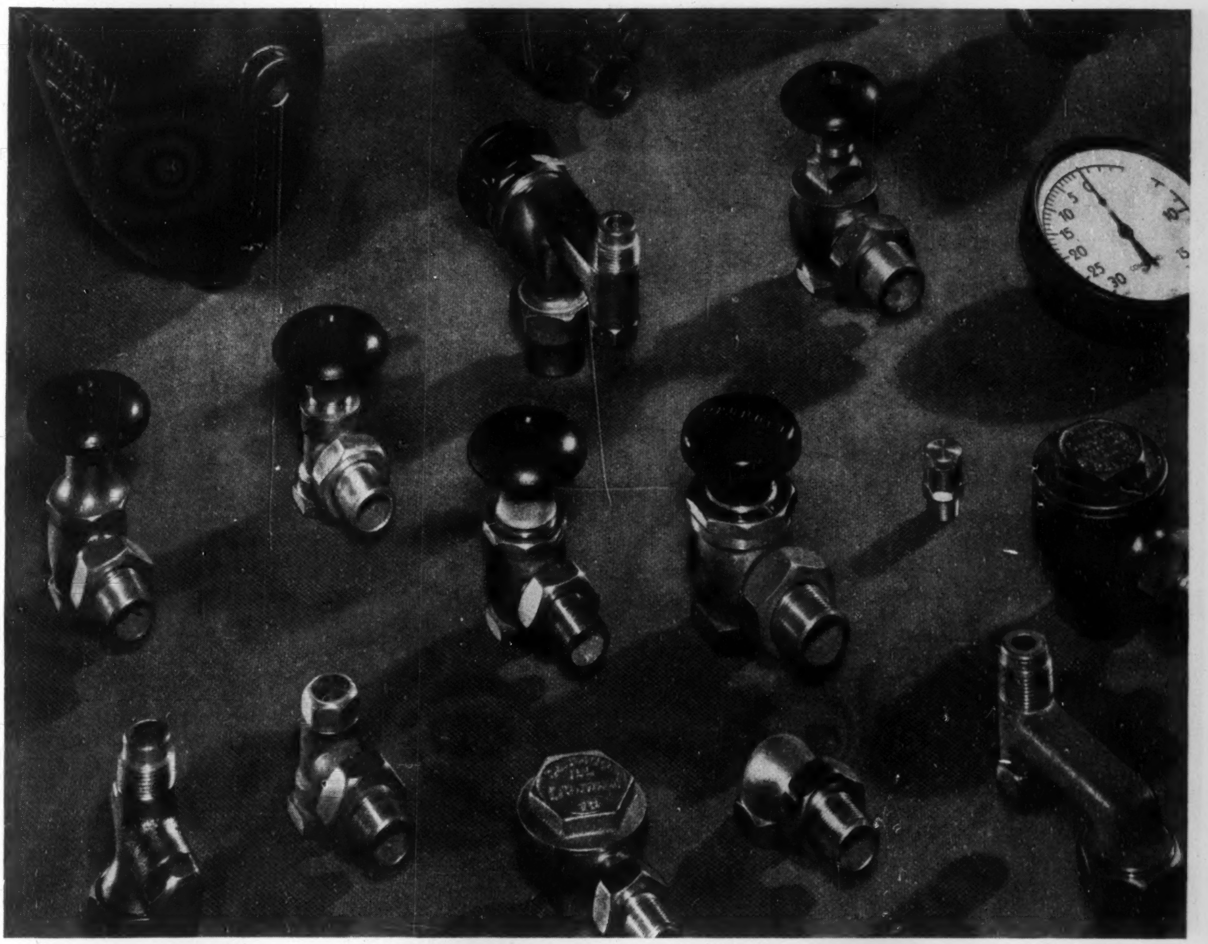
You can save on labor, too, by installing modern handling equipment. Modern coal-feeding and ash-removal systems can eliminate practically all hand labor.

Call in a consulting engineer. He can give advice on what equipment best fills your specific needs. And his recommendations may save you dollars year after year.

BITUMINOUS COAL INSTITUTE
A Department of National Coal Association
Southern Building, Washington 5, D. C.

FOR HIGH EFFICIENCY ◆ FOR LOW COST

YOU CAN COUNT ON COAL!



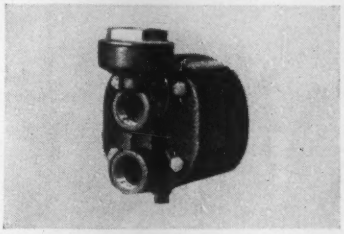
DUNHAM...YOUR SUPERMARKET FOR STEAM HEATING SPECIALTIES

In this broad Dunham line, there's a steam specialty to fit the requirements of any job. Since this selection is as complete as you'll find *anywhere,* buying Dunham is just as convenient and time-saving as buying in a supermarket. Every specialty has special design features, too.

Dunham Float and Thermostatic Traps, for example, have a vacuum sealed monel metal disc that assures positive response to temperature and pressure. Disc corrugations distribute motion uniformly with minimum strain, no vibration. Float valve assures a deep water seal at all times.

Less Maintenance: Thermostatic disc permanently adjusted at factory. Stop shoulder construction allows individual calibration when servicing traps in the field. Top and bottom cleanout plugs for easy flushing. Float valve assembly may be inspected without breaking piping connections. Interchangeable valve and seats.

For full information, clip and mail the coupon.



Dunham No. 30 Trap. Maximum working pressure: 15 lb. 5 sizes, ¾" to 2" incl. for capacities from 100 to 5750 lb. condensate per hour.

DUNHAM HEATING SPECIALTIES

RADIATION • UNIT HEATERS • PUMPS • SPECIALTIES

QUALITY FIRST FOR FIFTY-ONE YEARS

C. A. DUNHAM COMPANY • CHICAGO • TORONTO • LONDON

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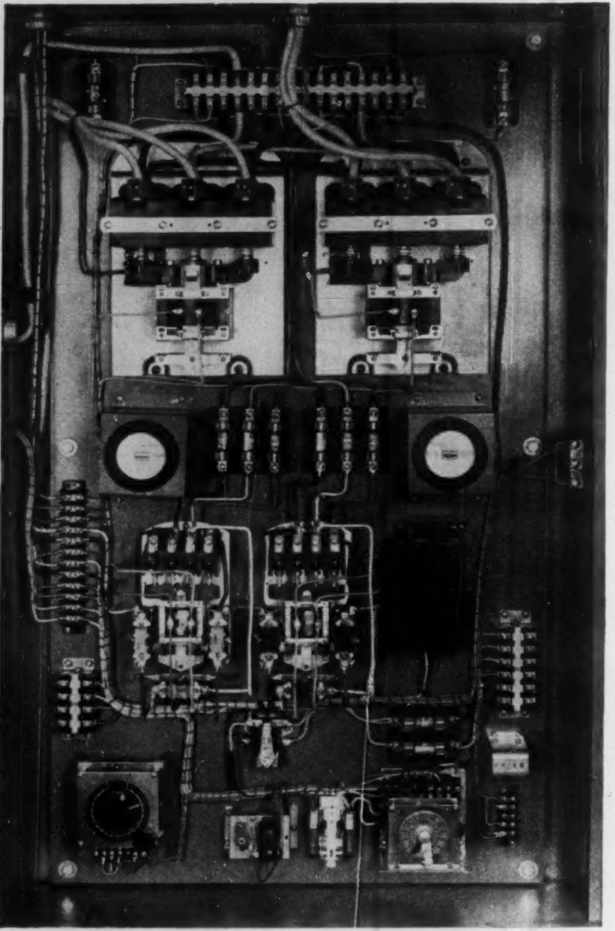


INTERIOR OF CONTROL PANEL shows two Ward Leonard three-pole contactors (near top of photo) and two motor starters (lower half of photo).

Dehumidifier controlled by Ward Leonard contactors and starters

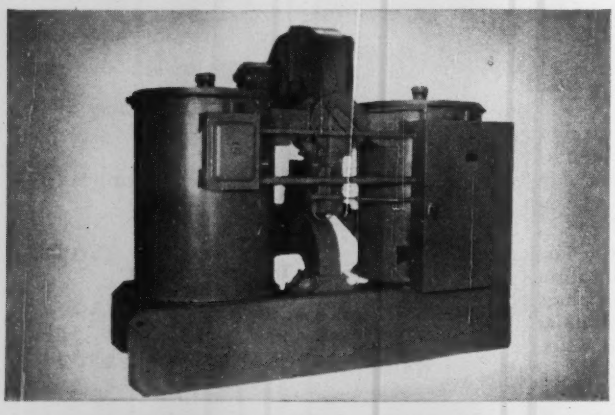
Two Ward Leonard three-pole solenoid contactors and across-the-line starters are an integral part of the control panel of the Desomatic Model DOR-800 Adsorbent Dehumidifier.

Daly, Merritt & Sullivan of Falls Church, Virginia, who manufacture the dehumidifier, needed electrical control components that could be readily installed in a custom control assembly.

The Ward Leonard contactors and starters which they selected fit this requirement because both are self-contained units . . . this results in simplified assembly, fast mounting and easy wiring.

Whatever the electrical requirements of your product, our engineers will be glad to help you select dependable controls to meet them. Write to Ward Leonard Electric Company, 20 South Street, Mt. Vernon, N. Y.

3-35



DESOMATIC DEHUMIDIFIER is used for preservation of equipment during long storage in warehouse buildings.

WARD LEONARD
ELECTRIC COMPANY
MOUNT VERNON, NEW YORK

RHEOSTATS RELAYS RESISTORS CHROMASTER

Result-Engineered Controls Since 1892

Ward Leonard's complete engineering textbook, "Handbook of Power Resistors," $3. per copy.

A thermostat in every room

FOR OFFICE BUILDINGS

The temperature of every office can be regulated to suit individual needs. Temperature stays at thermostat setting regardless of varied heat loss from glass areas, or from cold and warm sides of the building.

IRON FIREMAN SelecTemp CENTRAL HEATING

TRADE MARK

Continuous Modulated Heat with Individual Room Control, for Gas, Oil, or Coal

FOR APARTMENTS, HOTELS AND MOTELS

Occupants of each room can have the temperature they select without affecting the heat delivered to other rooms. The steam heat is continuous. Room units circulate warmed air, modulated automatically to balance heat loss from each room and maintain the individual temperature selected. No gas or combustion in rooms—no venting required.

FOR HOSPITALS, SCHOOLS, INSTITUTIONS

The varying needs of patients rooms, of service and operating rooms, of offices and public lounges, are met with extreme precision and with almost immediate response to any desired change of temperature. Filtered outside air for ventilation can be introduced when desired. Positive circulation of air within each room but no circulation *between* rooms.

FOR EVERY SIZE AND TYPE OF HOME

Any temperature desired is available in any room, at any time. For example: bathrooms at 75°, living room at 72°, work and play rooms at 65°, and grandmother's room or baby's bath at 78°. Air is warmed by steam, quietly circulated by steam driven fans and cleaned by efficient air filters. Room units have no electrical connections.

A COMPLETELY NEW CONCEPT IN HEATING

Iron Fireman SelecTemp is the only heating system that combines individual room control with continuous, modulated heat, yet initial and maintenance costs are *substantially less* than other zone control systems, with complex electrical equipment. No other system can accomplish these results in such a simple and practical way, or be so easily installed in either old or new construction. Added to this economy is the exceptionally low operating cost. Unused rooms can be kept at low temperature and then heated to a higher temperature, when desired, within a few minutes.

SelecTemp heating gives many important and unique advantages, not only to occupants but to owners and builders as well. For full information, mail the coupon.

SelecTemp

TRADE MARK

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IRON FIREMAN MANUFACTURING CO.
3153 W. 106th Street, Cleveland 11, Ohio.

Please send literature on Iron Fireman SelecTemp heating.

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● Maybe you didn't know it, but U. S. Steel Supply can supply you with everything you need in the way of industrial supplies, as well as with the *steel* you need.

Call us for—Dardelet Rivet Bolts, High Strength Bolts, Blakled (a new rust-inhibiting material), Grinding Wheels, expanded metal, chain and chain slings, welding electrodes, welding machines, clamps, Markal Paintstiks, Galv-Weld (for regalvanizing welded areas), mechanical rubber goods—conveyor belts, transmission belts, all types of hose, V-Belts, structural fabricating machinery, sheet metal machinery.

These items are carried in stock ready for immediate delivery. For complete information and literature, fill out the coupon below and send to us.

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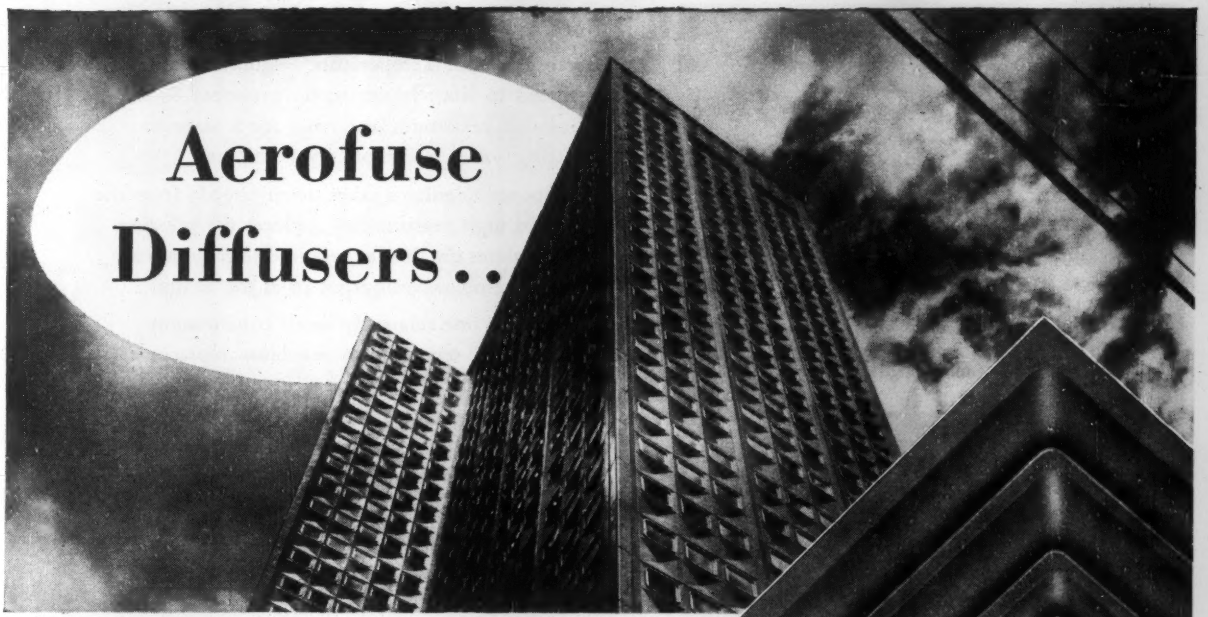
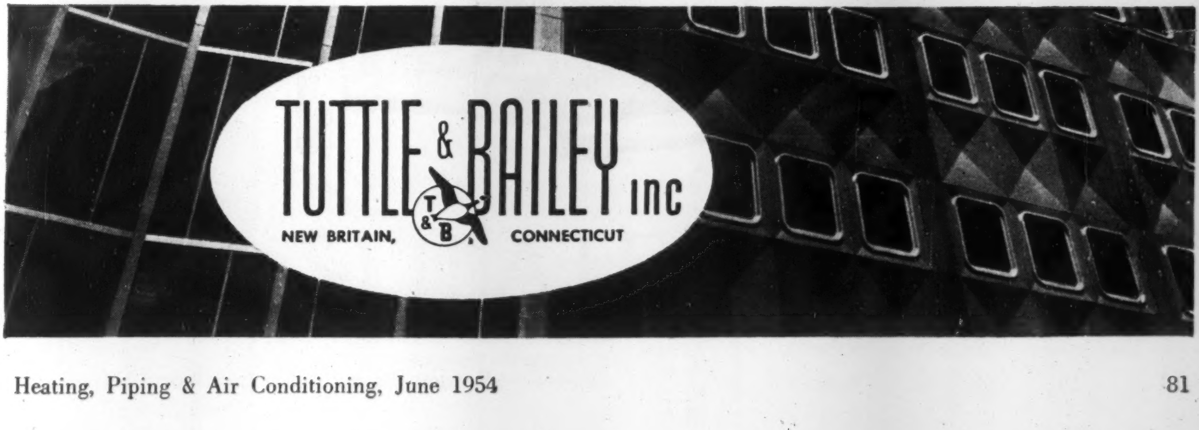


Aerofuse Diffusers..

... installed at the vital point of air delivery in the nation's first aluminum skyscraper ... ALCOA BUILDING

TYPE D AEROFUSE DIFFUSERS AS INSTALLED IN ALCOA

In the heart of Pittsburgh's Golden Triangle, the gleaming Alcoa Building rises thirty floors, a dramatic new concept in multi-story building design and construction. In Alcoa, as in other outstanding buildings from coast to coast — where the efficient performance and attractive appearance of air distribution equipment must meet rigid engineering and architectural specifications — Aerofuse Diffusers were selected for installation at the *vital point of air delivery.*



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NEW BRITAIN, CONNECTICUT

NO Reducing Valve Needed

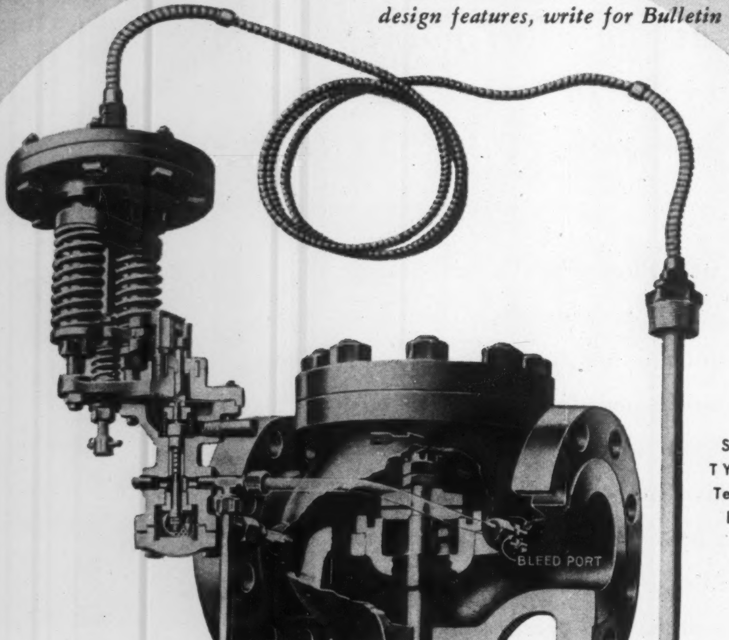
Here's real economy in temperature control.

Because Spence Temperature Regulators are designed to limit heater steam pressures to an adjustable maximum, the need for a separate reducing valve is completely eliminated.

The Spence Regulator takes steam directly from the boiler or high pressure line, reduces the pressure and regulates the flow as required to maintain a constant temperature output from the heater.

This means one relatively small combination pressure and temperature regulator replaces a reducing valve of the same size and a larger temperature regulator. Practically the entire cost of the large separate temperature regulator is saved. And, the total saving would also include the cost of a 3-valve by-pass along with all labor for installation.

This design feature is just one of the reasons for the thousands of Spence installations throughout American industry. *For details of other important design features, write for Bulletin T50.*



SPENCE
TYPE ET150
Temperature
Regulator

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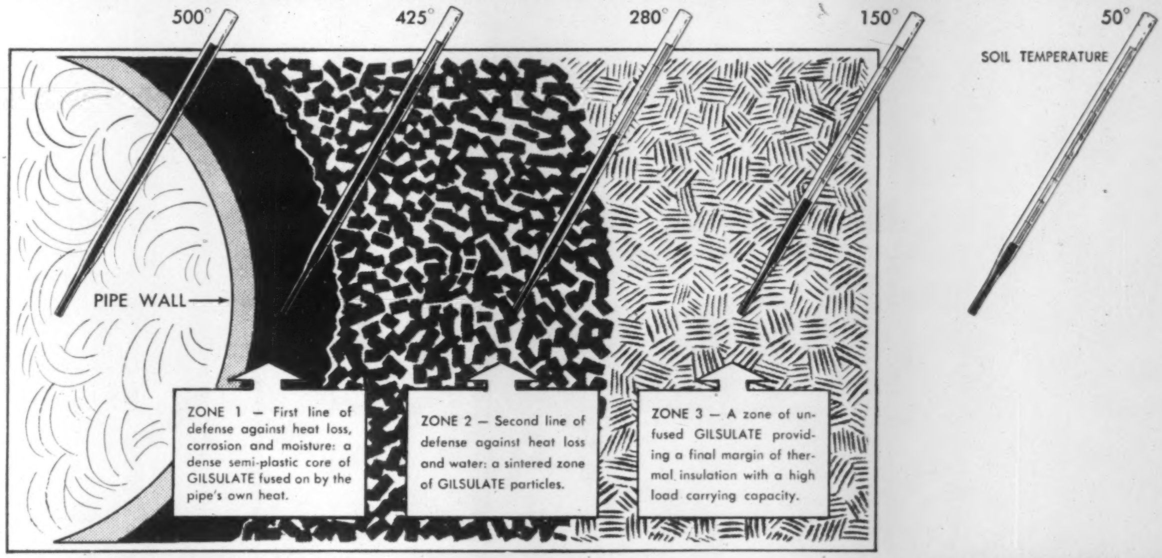
**SPENCE ENGINEERING
COMPANY, INC.**
WALDEN, NEW YORK

SE-131

Lowest Cost

PER INSTALLED LINEAR FOOT OF ANY HOT UNDERGROUND PIPE INSULATION


500°
425°
280°
150°
50°
SOIL TEMPERATURE
PIPE WALL
ZONE 1 — First line of defense against heat loss, corrosion and moisture: a dense semi-plastic core of GILSULATE fused on by the pipe's own heat.
ZONE 2 — Second line of defense against heat loss and water: a sintered zone of GILSULATE particles.
ZONE 3 — A zone of unfused GILSULATE providing a final margin of thermal insulation with a high load carrying capacity.

GILSULATE®... the triple-zone insulation that fuses itself into lifetime protection for hot underground pipes. Water-proof, corrosion-proof, root-proof, acid/alkali-proof.

Compare your present insulation methods with Gilsulation:

1. Pour Gilsulate granules out of the bag onto the pipe; tamp it down.
2. Backfill: *the job is insulated!*

Gilsulate—nature's own insulation—is a unique, solidified hydrocarbon that virtually installs itself. Normal pipe-heat (up to 520°F) does the rest—fuses the Gilsulate to the pipe in hours, forming a massive circular solidified sheath.

Gilsulate costs less installed per linear foot *than any other underground pipe insulation*... it's easiest to use... and has been tested in scores of the country's largest and most important installations.

Some additional Gilsulate advantages:

- *3 grades available*—220° to 520° F
- *needs no sleeves* or mechanical sheaths
- *requires no mixing* or special handling
- *can't be punctured*—leave rocks in backfill
- *pipe expands and contracts* within Gilsulate structure
- *proved in actual use* in hundreds of new construction and replacement installations

Send coupon for descriptive literature.

AMERICAN GILSONITE COMPANY
SALT LAKE CITY, UTAH
Affiliate of Barber Oil Corp. & Standard Oil Co. of California

No skills necessary—simply pour Gilsulate out of 100 pound bags, tamp and backfill. Can be used under any and all conditions—no matter how many pipes, whatever the space.

GILSULATE®

THE TRIPLE-ZONE INSULATION
FOR LIFETIME PROTECTION
OF HOT UNDERGROUND PIPES.

American Gilsonite Company
134 West Broadway, Salt Lake City 1, Utah
or 1145 East Jersey Street, Elizabeth 4, N. J.

Please send me descriptive literature on Gilsulate.

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COMPANY..
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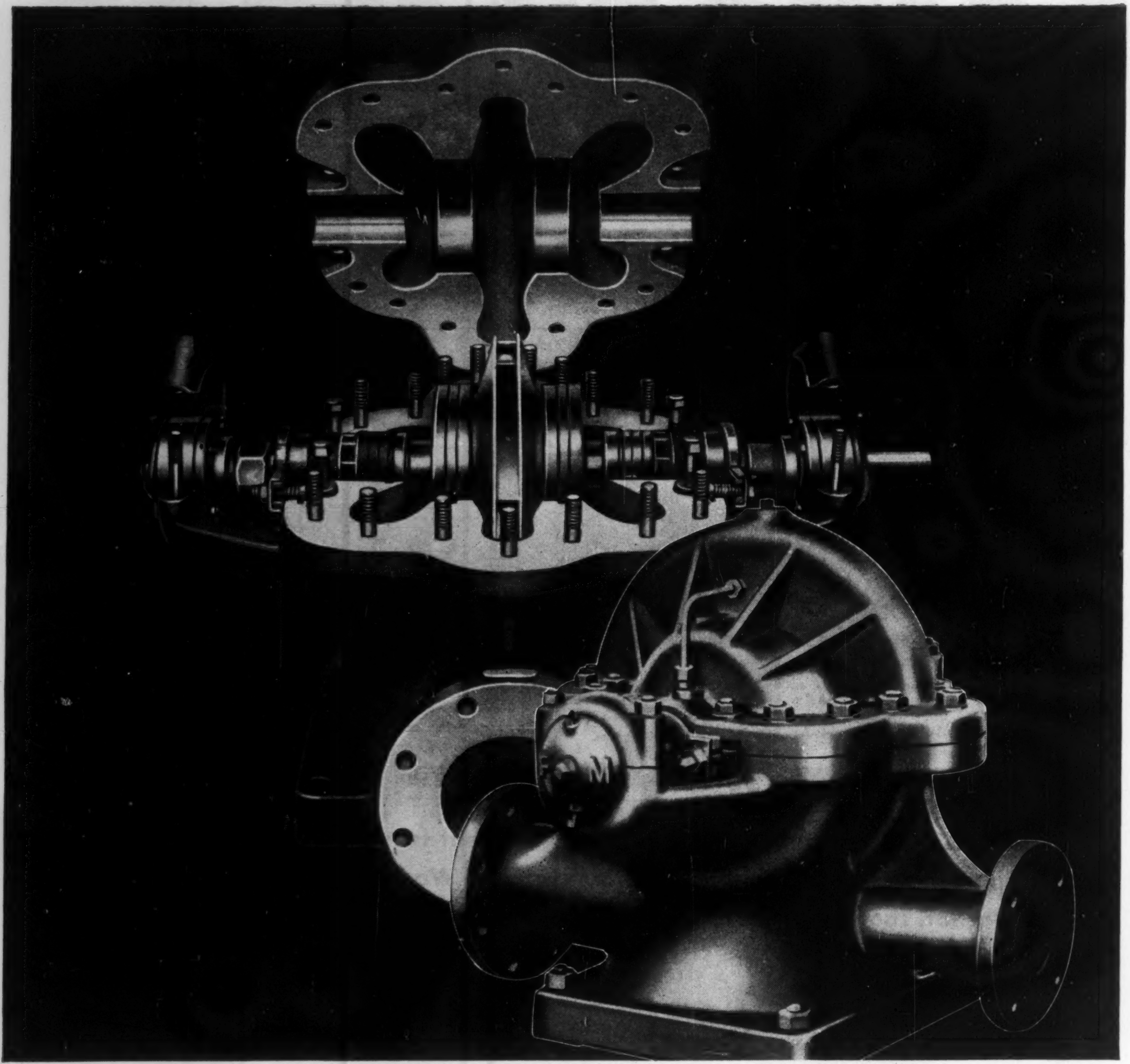


out of the mouth of a pump...

Suppose a pump could "spill its works" . . . tell you how it was made . . . speak of the design, material, workmanship that went into its being . . . then you could know . . . and buy with confidence.

Because after all, pumps do look very much alike. How, then, to tell which make is best for you. *Reputation* is one way, *performance* another.

And, on both counts, Fairbanks-Morse pumps stand out. Don't take our word for it. Check with Fairbanks-Morse users. We'll stand by their verdict. For Fairbanks-Morse has only one standard . . . *quality* . . . the quality that means dependability, service, low maintenance, all those important points that you want in the pumps you buy.

To get these advantages in your pumps, rely on the world's largest manufacturer of a complete pump line. See your nearest Fairbanks-Morse Branch, pump dealer, or write Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill.

FAIRBANKS-MORSE

a name worth remembering when you want the best

PUMPS • SCALES • DIESEL LOCOMOTIVES AND ENGINES • ELECTRICAL MACHINERY • RAIL CARS • HOME WATER SERVICE EQUIPMENT • FARM MACHINERY • MAGNETOS

Seven Pacific Boilers for the Columbia Point Housing Project. Architect – M. A. Dyer, Engineer – J. M. McCusker, Builder–John Bowen Co., Heating Contractor–M. J. Flaherty Co. All of Boston, Mass.

Seven big Pacific Boilers go into largest heating installation!

Columbia Point Housing Project installation is the biggest single heating unit in New England . . . a further indication that Pacific Boilers with Jet-action Circulation are becoming standard equipment for multiple dwellings, too.

The seven Pacific Boilers on the flatcars shown above are on their way to the Columbia Point Housing Project in South Boston, Massachusetts. They will be part of the largest heating installation in New England.

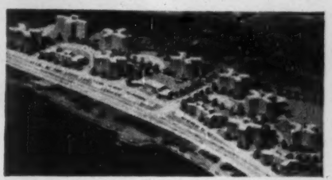
This scene is being repeated more and more often as the Pacific Jet-action story comes to the attention of heating contractors, builders, engineers and architects, everywhere.

Here's what Jet-action Circulation means: The special design of Pacific Circulating Connections causes a jet-like increase in the speed at which steam and hot water flow from the water leg. These high-velocity streams are trained directly on the heating tubes. They sweep away the insulating steam bubbles on the tubes and keep them in motion. The result: maximum heat transfer.

This modern heating principle is the most effective method for obtaining the greatest amount of heat from the fuel consumed.

If your installations should have the best, they deserve Pacific Boilers with Jet-action Circulation. For catalogs, engineering data or any other information you need, call your local Pacific representative, today.

OTHER PROMINENT PACIFIC INSTALLATIONS



Grafton Housing Project, Newark, N. J.

1350 Lake Shore Drive, Chicago, Ill.

Cross Country Manor Apartments, Baltimore, Md.

Designed
Constructed
and Stamped in
Accordance with
ASME Code

SBI

Pacific Steel Boiler

DIVISION • UNITED STATES RADIATOR CORPORATION

GENERAL OFFICES: DETROIT 31, MICHIGAN

Contains recommendations on
• proper type of insulation
• economic thickness
• right finish
• correct application
DS 649
Johns-Manville
ARCHITECTURAL AND ENGINEERING
JOHNS-MANVILLE JM PRODUCTS
INSULATION SPECIFICATIONS
CONDENSED FORM
• Heated Vessels and Equipment
• Heated Piping
• Refrigerated Vessels and Equipment
• Air Conditioning Ducts
• Refrigerated Piping

This new J-M Manual simplifies insulation specification writing

THIS MANUAL covers the architectural and engineering specifications for thermal insulations used in residences, commercial buildings, institutions and a wide variety of manufacturing plants.

These specifications are backed by almost a century of Johns-Manville experience in insulation engineering. As a result of this experience Johns-Manville today offers architects, engineers and users of insulations *complete* insulation service.

J-M Materials are available for every service temperature from minus 400F to plus 3000F. They include: J-M 85% Magnesia, Superex® and Rock Cork®, in pipe and block insulation form; Spintex, flexible duct insulation; as well as such finishing materials as Insulkote®, Asbestocite® and insulating cements.

J-M Engineering assures scientifically correct insulations for every job. J-M Engineers are called upon to solve insulation problems of every magnitude in every industry. Moreover, they have the resources of the Johns-Manville Research Center, largest laboratory of its kind in the world, where new and improved products are constantly being developed.

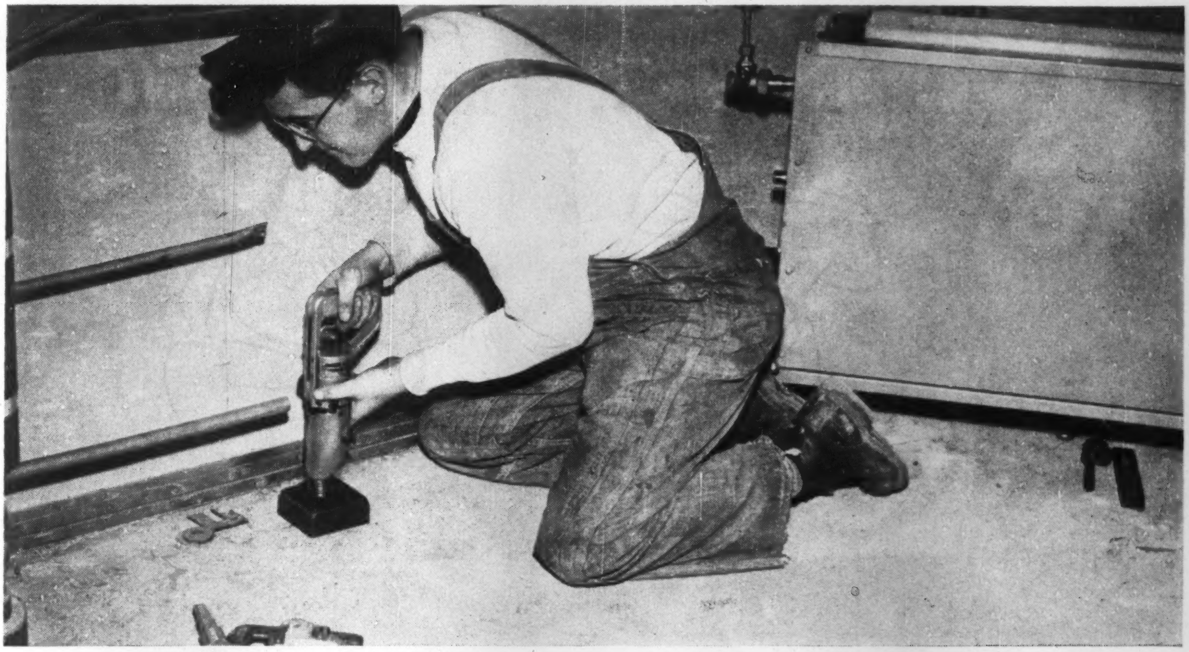
J-M Application assures long, trouble-free service with maximum performance from the insulation. Johns-Manville has a nation-wide organization of Insulation Contractors, staffed with men skilled in the application of J-M Insulations according to proven Johns-Manville methods.

JOHNS-MANVILLE JM PRODUCTS

Write today for your free copy of Architectural and Engineering Insulation Specifications Booklet DS649. Simply address Johns-Manville Box 60, New York 16, New York.

Johns-Manville *FIRST IN* INSULATION

MATERIALS • ENGINEERING • APPLICATION



Cut fastening costs up to 80% on heating and air conditioning installations... with the

REMINGTON STUD DRIVER

"It saves us money on every fixture we install"—that's the kind of report we're getting every day on the Remington Stud Driver. Big savings just naturally result from the amazing speed of this powder-actuated tool. It sets as many as 5 studs a minute in steel or concrete!

You'll find real economy, too, in the fact that the Stud Driver is completely self-powered—no need for extra equipment, wires or cables. Compact and portable, the tool is designed in every way for easy handling. And since it weighs only 6 pounds, it's ideal for working overhead and in confined spaces.

What's your fastening job? Whether it's fastening pipe to walls and ceilings or anchoring fixtures to concrete floors, you'll save money with the Remington Stud Driver. For complete information on how to cut *your* fastening costs, just send in the coupon below.

QUESTIONS YOU ARE ASKING

QUESTION:

What are the studs made of?

ANSWER:

Genuine Remington studs are made of a selected molybdenum-bearing alloy steel, heat-treated for required hardness and ductility properties. All are plated for protection against corrosion.

"If It's Remington—It's Right"

UL **Remington** DU PONT

Listed & Approved by Underwriters' Laboratories, Inc.

MAIL THIS COUPON TODAY

REMINGTON
STUD DRIVER

Industrial Sales Division, Dept. HPAC-6
Remington Arms Company, Inc.
Bridgeport 2, Connecticut

Please send me free copies of the new booklets showing how I can cut my fastening costs.

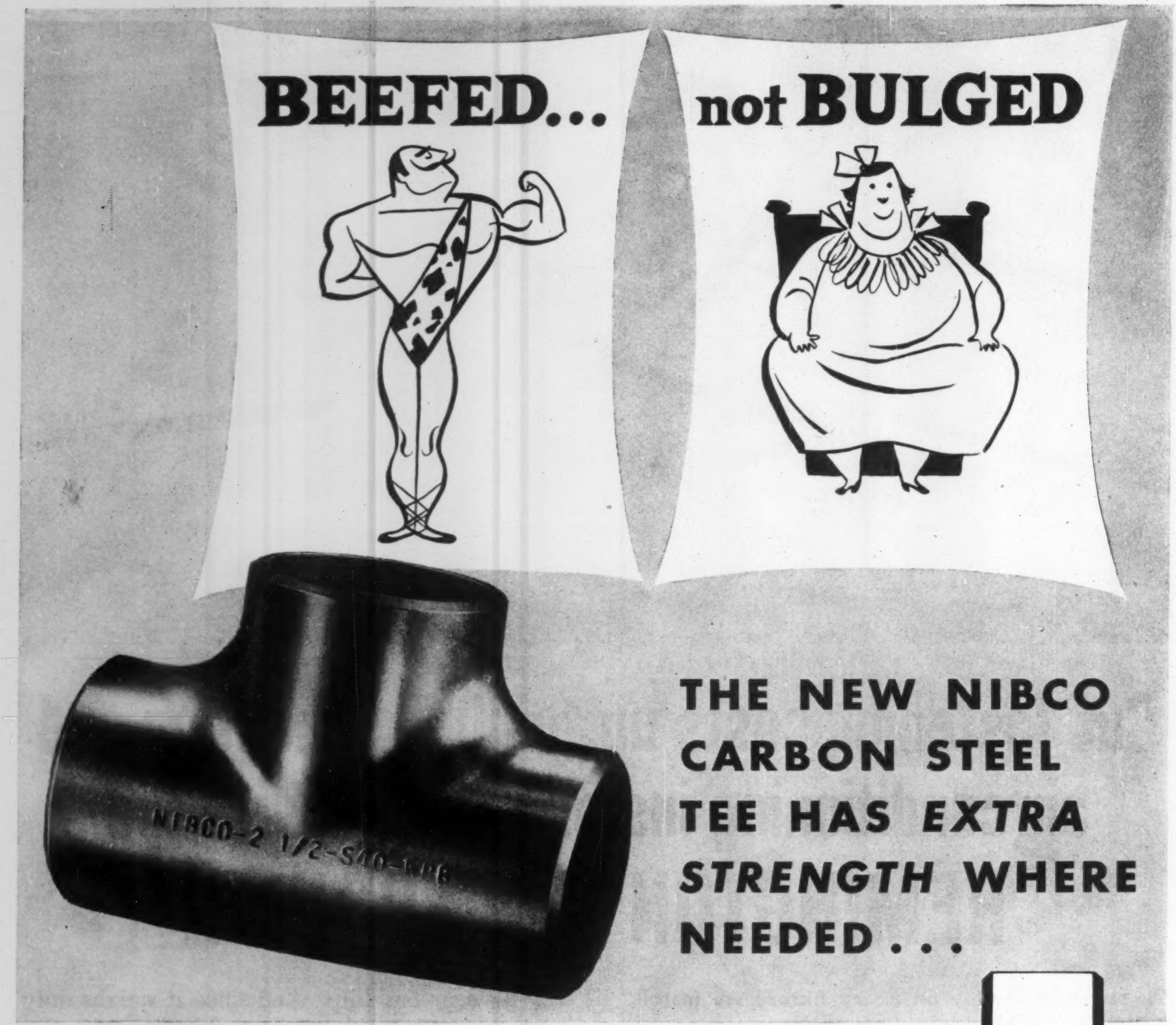
*Name*________________________

*Position*________________________

*Firm*________________________

*Address*________________________

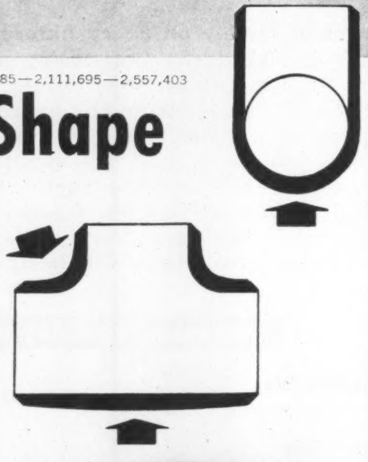
*City*______________ *State*__________



THE NEW NIBCO CARBON STEEL TEE HAS *EXTRA STRENGTH* WHERE NEEDED . . .

U. S. PATENTS 2,027,285—2,111,695—2,557,403

Look for the BRAWNY Shape



Clue to the quality of the NIBCO Carbon Steel Tee is the distinctive "BRAWNY" shape. But you really need to look inside to see that this tee is beefed; not bulged. There's extra wall thickness where extra strength is needed. NIBCO's exclusive forming process creates a denser grain structure that also makes the tee stronger and more resistant to corrosion. The beautiful cold-formed finish and the unrestricted passages inside the fittings add to the superior performance of NIBCO "BRAWNY" Carbon Steel Welding Tees. You can get them through your regular source of supply.

NORTHERN INDIANA BRASS COMPANY
671 Plum Street, Elkhart, Indiana

NIBCO

A NEW DEVELOPMENT
OF
ARMSTRONG RESEARCH

LT-30 cork covering . . . ***a new kind of pipe insulation for dual temperature lines***

Here's a brand-new insulation that offers the high efficiency, strength, and long life of molded cork covering, yet can be installed at much lower cost.

This new material, LT-30 Cork Covering, is fabricated from precision-cut sections of Armstrong's Corkboard, bonded to a special three-ply vaporproof paper. It's used on dual temperature air-conditioning lines, chilled water, and other cold lines. LT-30 prevents sweating under normal conditions where liquid temperatures in the line are 30° F. or above. On hot water cycles, it withstands temperatures up to 200° F.

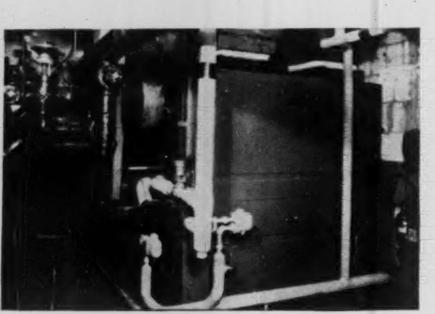
Application is fast and easy. Simply apply LT-30 Adhesive to an overlap, hold the covering around the pipe, and press the lap in place.

LT-30 Cork Covering is another product of Armstrong's continuing efforts in the laboratory and in the field to improve insulation materials and application methods. For further details on LT-30 Cork Covering, as well as on Armstrong's regular line of molded cork covering, and other industrial insulations, call your nearest Armstrong office or write Armstrong Cork Company, 202 Stratton Street, Lancaster, Pennsylvania.

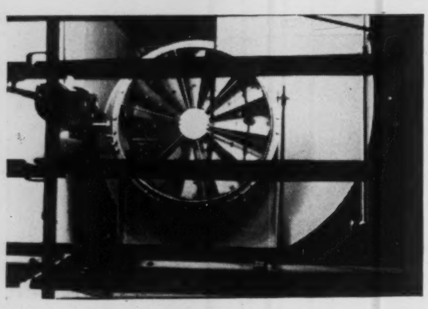
After the covering is wrapped around the pipe, joints are sealed by strips of LT-30 Paper. There is no need for a further indoor finish, but where color identification is desirable, Armstrong's Insulcolor may be applied.

ARMSTRONG'S INDUSTRIAL INSULATIONS

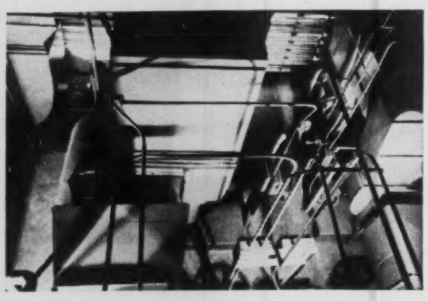
Basement – Sirocco Fans circulate fresh, dehumidified air. Total rating of American Blower equipment in building is 770,378 cfm. Gross floor area is 503,000 sq. ft.



2nd floor – The Prudential Building uses 10 American Blower Air Conditioners like this one in its mammoth air-circulating, cooling and dehumidifying installation.



5th floor – One of 50 American Blower Supply Fans that furnish air to various offices. Other equipment includes: American Blower Heating & Cooling Coils, Utility Sets.



20th floor – A group of four powerful Sirocco Exhaust Fans in a louvered section of the Prudential Building's 20th floor help get rid of stale air from the many offices.

American Blower Equipment Keeps Prudential Comfortable

The completely air-conditioned 21-story Southwestern Home Office of the Prudential Insurance Company of America in Houston, Texas, is a credit to the company and to the area it serves.

American Blower fans, heating and cooling coils, air-conditioning units, and heating and ventilating units, all serve to condition and circulate air to the occupied spaces of the building in accordance with the carefully thought out plans of the consulting engineers, Dale S. Cooper & Associates.

Why was American Blower selected?

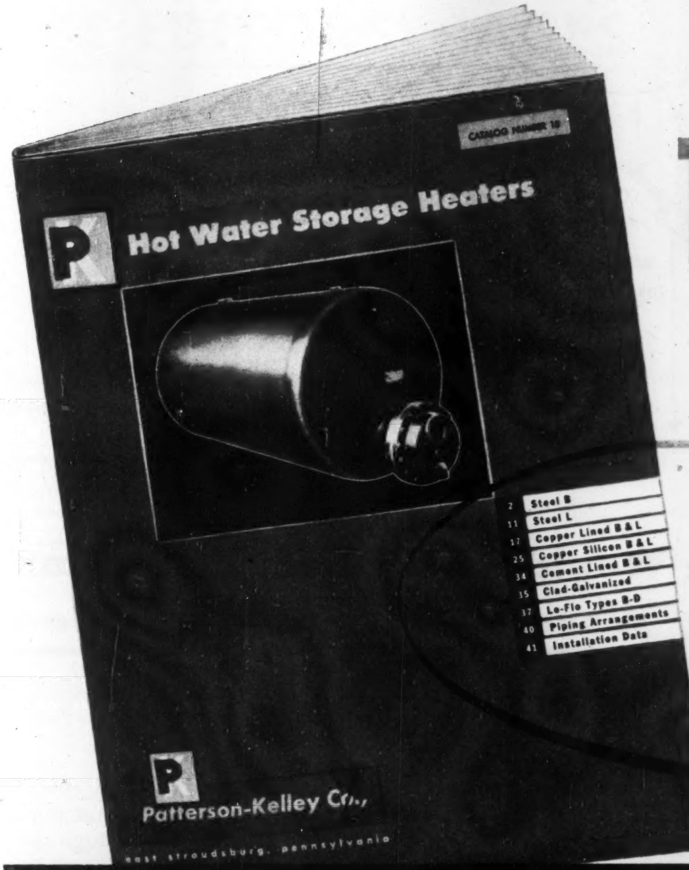
W. A. Harbaugh of Straus-Frank Co., mechanical contractors, states: "I can depend on American Blower service and the performance of their equipment—and that is worth money to me."

You, too, can depend on American Blower. If you have an air-handling problem, call your nearest American Blower or Canadian Sirocco Branch Office. American Blower engineers have a complete knowledge of the air cycle, and can supply the equipment to meet the special problems of many industries.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American Radiator & Standard Sanitary Corporation

AMERICAN BLOWER

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS


CATALOG NUMBER 18
P
Hot Water Storage Heaters
2 Steel B
11 Steel L
17 Copper Lined B & L
25 Copper Silicon B & L
34 Cement Lined B & L
35 Clad-Galvanized
37 Lo-Flo Types B-D
40 Piping Arrangements
41 Installation Data
P
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TO HELP YOU SELECT and INSTALL

HOT WATER STORAGE HEATERS

All the facts you need to select and install hot water storage heaters . . . the most economical way to provide for peak hot water demands.

A new edition, expanded and revised to include the most up-to-date recommendations — one of the most complete reference catalogs of its kind. Covers all types, sizes and styles of hot water storage heaters . . . **p-k**, of course.

A basic reference work for architects, engineers and contractors selecting and installing hot water systems, and for users of hot water for process and service.

the ***Patterson-Kelley Co.,*** inc.

760 Burson Street, East Stroudsburg, Penn.

No Cost

No Obligation

Your copy is waiting for you.
Either fill out the coupon or simply
sign it and attach to your letterhead.

Please send me my copy of the *new* p-k hot water storage heater manual, Catalog 18. I understand that there is no cost or obligation.

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TITLE____________________

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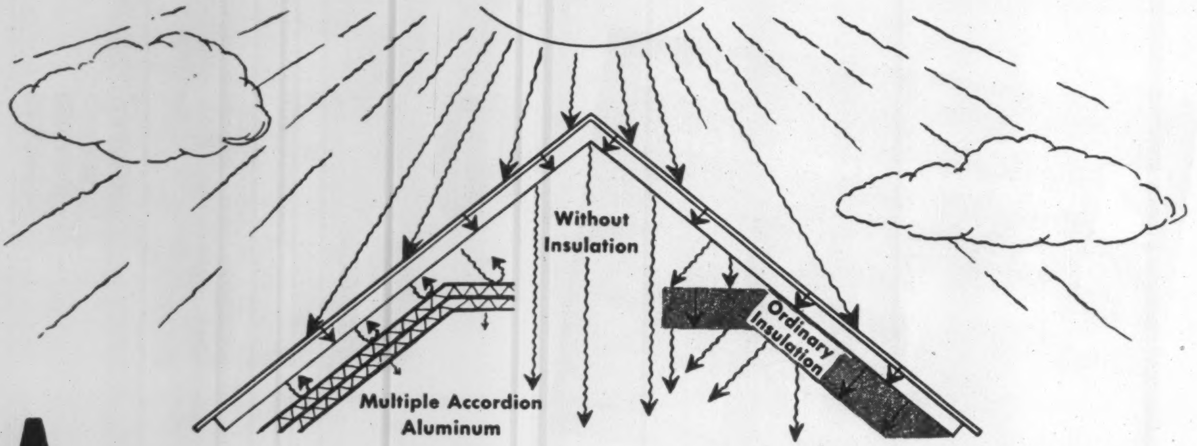
101 Park Avenue, New York 17 • Railway Exchange Building, Chicago 4 • 1700 Walnut Street, Philadelphia 3 • 96-A Huntington Avenue, Boston 16 • and other principal cities



An Empty Roof Space Would Be The Best Insulation Against Summer Sun, *Were It Not For Radiation*

But substantially the only summer heat flow through empty roof space is Radiation. There is slight Conduction. Heat flow by Conduction through any building space is about 7% of the total. Convection is not a problem—there is no Convection downward.

Ordinary insulation may retard heat for a time, but stores a large amount of heat as compared to empty space. More dense, it is a much better conductor of heat than just air and so more heat passes through it by conduction. Its surfaces have a heat ray absorptivity and emissivity of over 90% and radiate heat into the building through the day, and sometimes into the night.

The solution is to use a material which has little substance and whose surfaces will absorb and emit little radiation. Gold or silver foil would be excellent, but tough multiple accordion aluminum, which weighs but ¼ oz. per sq. ft., is inexpensive and almost as good, with a heat ray absorptivity and emissivity of only 3%.

The metal sheets of multiple accordion aluminum are impervious to water vapor and are continuous, 500 ft. to 750 ft. long. Infiltration under their flat stapled flanges is slight. The scientific construction of multiple layers of aluminum, fiber, and air spaces minimizes condensation formation on or within this type of insulation. Its slight mass is capable of little heat storage.

The National Bureau of Standards Booklet BMS52, "Effect of Ceiling Insulation Upon Summer Comfort" lists on Page 10 the relative effectiveness of the insulations tested in protecting ceilings against summer heat. First in effectiveness was two layers of aluminum foil (both sides of each layer reflecting). Second was full thick (3⅝-inch) ordinary insulation. (Use coupon to get the booklet FREE!)

Try this test: Tack or scotch-tape 3 sq. ft. of multiple accordion aluminum (we will send it free on request) to the underside of a hot roof or ceiling, whether uninsulated, or insulated with ordinary material. Step in and out of the protected area beneath. The difference will be so marked you will need no thermometer.

A *new multiple accordion aluminum, Infra, Types 6-S*i*, and 4-S*i*, gives **edge to edge** insulation between beams or studs, forming a "blanket" of uniform depth against heat and vapor flow, and condensation formation.

*Patent applied for.

COST OF INFRA INSTALLED
in new construction between wood joists, material with labor,

Type 6-Si under 9½¢ sq. ft.
Type 4-Si under 7½¢ sq. ft.

INFRA INSULATION INC.
525 Broadway, N.Y.C., Dept. H-6
Please send FREE:
☐ Bureau of Standards Booklet, BMS 52, "Effect of Ceiling Insulation upon Summer Comfort."
☐ 3 Ft. Square of Multiple Accordion Aluminum for Test
Name____________________
Firm____________________
Address____________________

INFRA INSULATION, INC., 525 BROADWAY, NEW YORK, N. Y.

THE EDITORS' PAGES

• *ON THESE PAGES last month — the occasion being the 25th anniversary issue of Heating, Piping & Air Conditioning — we reviewed some of the changes over the past quarter of a century. Many of the May articles also took a look at the past, and a peek or two at the future. We want to make one more reference to our 25th anniversary, before we buckle down to the next 25 busy years — and that is to thank all those readers of HPAC and our other friends who have complimented us on our birthday and our "birthday issue."*

Construction Boom Continues

. . . '54 sets new record

CONTRACT AWARDS for future construction in the 37 eastern states, as reported by the F. W. Dodge Corp., remained at extremely high levels in April. The total for the first four months set a new high for the first four months in any year of the 63 year history of the Dodge Corp. It was eight percent ahead of the first four months of 1953 which set the previous high.

Thomas S. Holden, vice chairman of the Dodge Corp. commented: "The extremely high April totals indicate a continuation of the unprecedented boom in construction activity reported thus far in 1954. Contract awards in January, February and March of this year set new all-time monthly records for those months. The April figures, while they are three percent behind those for April of 1953, actually indicate no slackening of pace.

"As these contract awards are widely used as an indicator of economic trends, it is important to note that April of this year cannot be strictly compared with April of last year because of the inclusion of a considerable amount of atomic energy work in last year's April figure," he said.

"If this unusual item is disregarded in last year's April total, what might be called ordinary contract award activity in April of this year was well ahead of last year," he concluded.

Record Sales, Earnings, Order Backlog

. . . shown in annual report

THE AMERICAN Air Filter Co., Inc., established new records in sales, net profits and orders booked during the year ended October 31, 1953, W. M. Reed, president, has reported. Net shipments were $25,216,508, compared with $23,245,399 in 1952. Net profit was $1,034,696, compared with $986, 674 in 1952, and equaled $2.61 per share of common stock compared with $2.51 in 1952.

Mr. Reed said that orders for AAF air filter and Herman Nelson heating and ventilating products totaled $27,075,000 during the 1953 fiscal year, compared with $25,849,000 in 1952. The unfilled order backlog was $14,200,000 on October 31, compared with $12,596,000 the previous year.

Predicts $450 Million Room Conditioner Sales

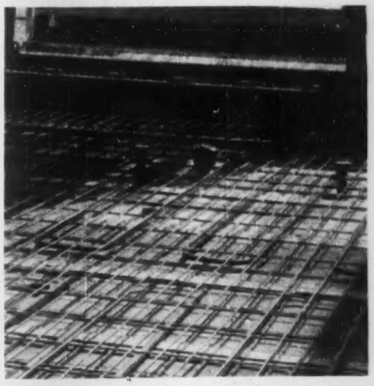
. . . unusually warm weather

GOOD GENERAL business conditions will team up with unusually warm weather to produce a minimum of $450 million in room air conditioner sales (1½ million units) for 1954, Eugene A. Tracey, vice president of the Mitchell Mfg. Co., predicts.

He quoted two authorities for his business and weather forecasts. One is Sumner Slichter, well-known Harvard economist, who — Mr. Tracey said — has found "that for the past six months the ratio of consumption of consumer durable goods has been $3 billion higher than production."

Mr. Tracey based his weather outlook on an "amazingly accurate" four-month forecast made for the Mitchell company each year by the research organization that predicted weather for General Eisenhower in the Normandy invasion during World War II.

This year, he said, there will be a "warmer June and July prospect for the entire country east of Kansas City, but for approximately 500 miles in all directions from Chicago, the heat will be unusually high in June."



ACCESS DECK to outside generator at the new Far Rockaway power station has snow melting system to facilitate operation and maintenance in winter

Snow Melting System for Outside Generator

. . . at utility's plant

ONE OF THE more unique applications of snow melting systems is an access deck to an outside generator at the new Far Rockaway power station of the Long Island Lighting Co., Long Island, N. Y. Heat from the wrought iron coils will warm the concrete pavement to eliminate hazards created by freezing rain and keep the access deck of the generator free of ice and snow. The system, designed by Ebasco Services, New York, assures operators and maintenance personnel of safe access to the generator area even during severe winter weather.

Cleveland Air Conditions Its Public Auditorium

. . . seeks conventions

INSTALLATION OF three large centrifugal refrigerating machines to handle the Cleveland public auditorium's complete air conditioning program has been announced. Similar to the big cooling machines installed in Chicago for the last national political conventions, the Cleveland system has one additional refrigerating machine and 25 percent more capacity.

The system is designed to handle all cooling and dehumidifying requirements with the main auditorium packed to its 10,000 seat capacity, and with the 300 seat music hall also filled, according to the Carrier Corp.

As the installation for the new system was announced, Cleveland's convention and trade show bureau was already laying plans to try to bring presidential conventions to that city.

The campaign to air condition the hall has been actively under way for more than a year since the Chicago conventions. Senator Thomas Burke, then mayor of the city, returned from his stay as a delegate to the Democratic convention and immediately placed the full support of his city administration behind the move. "I'm convinced," he stated at the time. "Even though the hall was crowded, it was pleasant wearing a suit coat. I don't see how the convention could have been held in an auditorium that was not air conditioned. It would have been intolerable."

In the Cleveland auditorium, two of the centrifugal cooling machines, with cooling capacities of 600 and 400 tons, respectively, handle the main hall. A third 250 ton machine serves the little theater.

Consulting engineer for the job is Vincent Eaton. The Smith and Oby Co. is the mechanical contractor.

Launch Study on Steel Pipe Coatings

. . . organic, metallic

An extensive research program on organic and metallic coatings for better protection of steel pipe in aggressive waters, corrosive soils and for handling chemicals has been launched by the Committee on Steel Pipe Research of the American Iron and Steel Institute with the assignment of the project to Battelle Memorial Institute, Columbus, Ohio.

Initially, a survey is planned of available materials, followed by a study of those that appear to meet requirements and which could be applied at a cost competitive with coatings now in general use.

The various coating materials will be tested and classified for the temperature ranges in which they can be used for hot water supplies, application techniques, surface preparation, cost of coatings applied, freedom from toxicity, most effective thickness, precautionary steps if any during application and other characteristics which steel pipe coating must possess to meet the needs of industry, commerce, farm and home, says the committee.

"Quote"

"I'm convinced. I don't see how the convention could have been held in an auditorium that was not air conditioned. It would have been intolerable." — *Senator Thomas Burke, upon his return from the last Democratic national convention.*

St. Louis First U.S. City To Control Smoke

. . . London engineers told

The tragic smogs of London, England (population 8 million) and Donora, Pa., (population 15,000) have done more than any other single event to stir the British and American publics into action on air pollution control, an American expert told an audience of engineers in London recently.

Frederick S. Mallette, executive secretary of the committte on air pollution controls of the American Society of Mechanical Engineers, said that St. Louis was probably the first large city in the United States that effectively reduced smoke pollution. Only 5½ hr of moderate smoke were counted there in a 12 month period ending April 1953, as compared to 716½ hours during a seven month period ending March 1940. The city's citizens' smoke abatement league has estimated the extra cost of the smoke nuisance before abatement at $14 million.

Spectacular results in smoke abatement have also been achieved in Allegheny County, Pa., including Pittsburgh, he said.

The St. Louis smoke abatement program was described some years ago in an extensive series of articles in Heating, Piping & Air Conditioning by Raymond R. Tucker, smoke commissioner of that city from 1937 to 1942, and now its mayor. An important part of the program is the use of mechanical firing equipment.

New Plant Shows Faith in Air Conditioning

. . . fast growing industry

Speaking at ground-breaking ceremonies for a new hermetic motor plant at Holland, Mich., Ab Martin, general manager of the General Electric Co.'s hermetic motor department, said that it "is evidence of the company's faith in one of the fastest growing industries in our economy — air conditioning."

Manufacturing at the plant is scheduled to begin in 1955, after which the motor headquarters will be transferred to the new site, he said.

"Air Pollution Expert" Needed In Industry

. . . to spot trouble

The post of "air pollution expert" is demanded in many large corporations because the problems have become complex and the issues at stake large, according to William E. Rand, director of research in physical sciences at Stanford Research Institute, before the 1954 Southern Industrial Wastes Conference. He said that "the greatest value of the pollution expert to management is his ability to spot potential trouble before it becomes severe."

Room Air Conditioner Shipments Up 95 Percent

. . . during first quarter

Shipments of room air conditioners by manufacturers during the first three months of 1954 show a surprising increase of 95.3 percent over the same three months of 1953, according to George S. Jones, Jr., managing director of the Air-Conditioning and Refrigeration Institute.

This increase is shown in a study by the ARI which indicates that about 568,400 room air conditioning units were shipped by manufacturers during the first quarter of 1954.

Control Maker Reports Record Sales

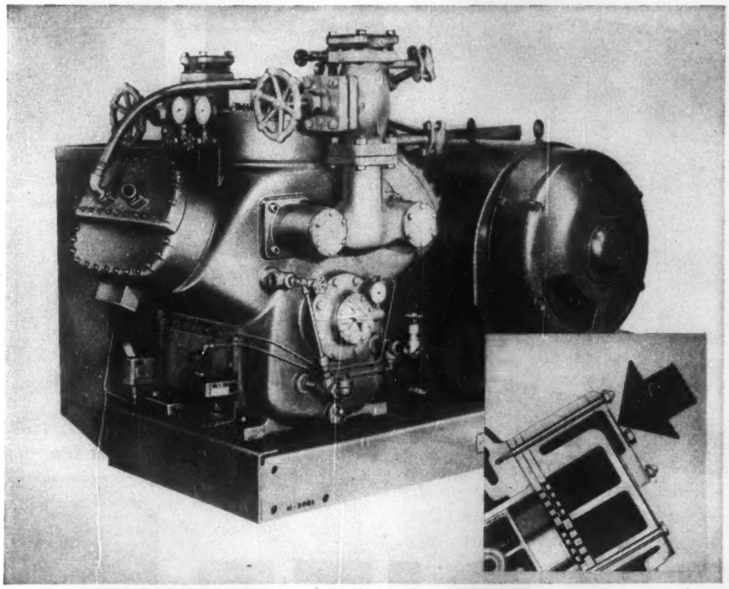
. . . top $200 million mark

Sales of Minneapolis-Honeywell Regulator Co. increased approximately 29 percent in 1953 to pass the $200 million mark for the first time in the company's history, the annual report disclosed.

Sales totaled $214,018,825. Earnings before taxes were up $8,082,822 over the previous year to a total of $28,687,825.

The company spent $7,100,000 during the year for expansion of plants and equipment, including the acquisition of enlarged facilities in a Minneapolis suburb for its Research Center. Also, capital additions totaling $1,500,000 were authorized to be completed in 1954.

Look at all the features of Worthington's new high-speed ammonia compressor



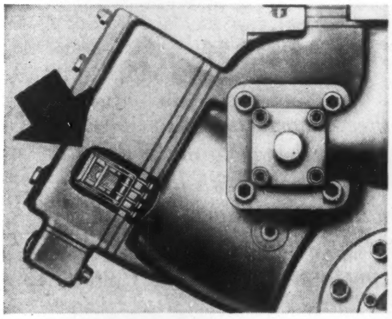
IMPROVED INTERNAL MANIFOLDING—cool suction gas completely surrounds the cylinder walls, providing longer valve life and increased overall efficiency. All passageways between suction discharge and shutoff valves are cast integrally within the crankcase, eliminating outboard fittings. Cross section shows water jacketing on one of the cylinders.

High operating efficiency and lighter weight make this modern unit the talk of the industry

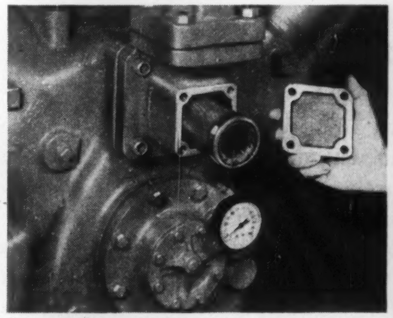
These lightweight, compact Worthington ammonia compressors have the same high operating efficiency and versatility as their lower speed counterparts.

Ranging in capacities from 18 to 150 tons, the new units can be used as high-stage or booster machines.

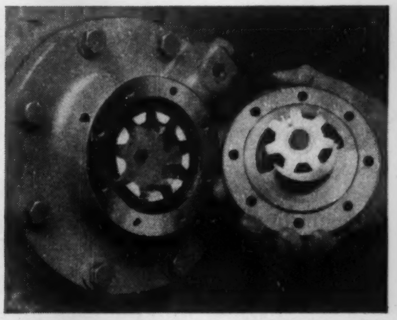
Get in touch with your nearest Worthington district office for more facts about these rugged compressors. Or write to Worthington Corporation, Air Conditioning and Refrigeration Division, Section A.3.56, Holyoke, Mass.



ELECTRIC UNLOADING—a new achievement in variable capacity control. You can start compressor with a normal torque motor; power consumption is automatically balanced against load. Separate unloader units allow easy maintenance . . . no oil or gas pressure lines to worry about.



NEW SUCTION MANIFOLD, with cover plate over suction strainer inlet, allows easy removal of the suction gas strainer for cleaning, without disturbing any of the pipes, valves or other parts. The strainer is unique in that it fits entirely within the crankcase manifold, requiring no additional space.



NEW FORCE-FEED LUBRICATION SYSTEM — full pressure, positive lubrication, regardless of rotation. A new rotary oil pump, driven directly by the crankshaft, eliminates complicated and noisy gear trains. Oil is filtered through a strainer in the crankcase for protection of pump and other moving parts.

A.3.56

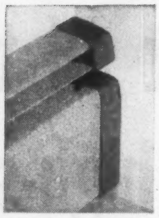
WORTHINGTON

CLIMATE ENGINEERS TO INDUSTRY, BUSINESS AND THE HOME

How to win friends and **MAKE MONEY**

Send for Publication 272

End Cap


Wall Section

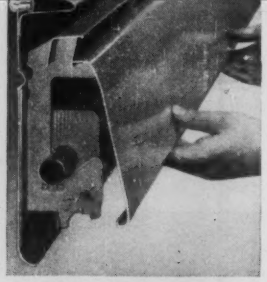
Inside Corner

Damper

Outside Corner

Joint Trim

Support Bracket



NESBITT

Baseboard Radiation

When you have snapped the last front panel into place and have trimmed out with accessories, your installation of Nesbitt Baseboard Radiation is complete and you have accomplished four things: First, you have had as much fun as a kid putting together the fitted parts of a prefabricated toy. Second, with the least possible exertion and in record time you have provided a high capacity system of perimeter convector-radiation along exposed walls. Third, you have assured the full-zone comfort and contemporary beauty that makes customers friends. And fourth, you have made a quick profit.

Where other manufacturers of "baseboard" left off, Nesbitt began to make a really effective space heater with four square feet of radiation per lineal foot of corrugated fin element—adequate for one-wall performance in most rooms—and housed in a beautiful slim enclosure. Nesbitt tooled a large factory area to produce this product at the lowest cost in standard nominal lengths of four, six and eight feet—with every labor-saving provision and needed accessory—for you!

All leading makes of **BASEBOARD** have *something*-
but *something* is not enough when **NESBITT** gives you *everything*!

MADE BY JOHN J. NESBITT, INC., PHILADELPHIA 36, PA. • SOLD EXCLUSIVELY THROUGH PLUMBING AND HEATING WHOLESALERS

"OPEN FOR DISCUSSION"

• *WE FOLLOW HERE each month the practice at engineering society meetings of providing an "open for discussion" period. You are urged to take part. Just address your comments to the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*

ARTHUR J. HESS —

"Mother Was Funny That Way"

I. W. COTTON's article, *Things Were Different Then,* published in the May HPAC, surely recreated memories of a summer (1929) I spent in Phoenix trying to design a steam plant. The temperature was 110 F even at night, and the drawing was on tracing cloth. I well recall attending the movies to get the benefit of air conditioning every evening, whether the picture changed or not.

I am also reminded of an incident in Los Angeles. In 1927, a new theater was built with air conditioning and pipe organ. In 1928, my engineering club at college had an inspection trip there and I was so impressed with the cooling that I persuaded my mother to take my younger brother on Saturday afternoon. He was 13 at the time and describes the event as follows:

"It was real hot and Ma and I had to wait a little to get in. Gee, it sure felt swell. We sat down to watch the picture that was just ending, when I felt my arm being torn off. It was Ma jerking me outside, and muttering that the good Lord hadn't made the air that comfortable and it was sinful to sit there like that. There ought to be a law."

Mother was funny that way. Because my father was a heating contractor and all of our living came from heating, I guess she figured air conditioning came from the hot places — the proprietor of which she could snub without any worry.— ARTHUR J. HESS, President, Hess-Greiner & Polland, and President, American Society of Refrigerating Engineers.

R. C. BELLAS —

"Why Not Recover Hot Condensate?"

REFERRING TO the article, *Changing Plant Piping,* by C. T. Baker, in the April issue of your most interesting magazine, we would like to comment on Case No. 2, in which an undesirable condition was eliminated by the addition of a heat exchanger, as shown in Fig. 3 of the article.

The statement, "since the hourly heat release to the atmosphere was quite large," indicates a large release of flash steam which, of course, dictated the use of the heat exchanger in the first place. However, it must follow that the flash steam condensing in the heat exchanger will result in a quantity of condensate, uncontaminated, that should be recovered for feed purpose. Fig. 3 shows this being discharged to waste by the "1 in. drip to sewer," when, by one of several simple piping connections, recovery could be accomplished.

True, the temperature loss is present, but it cannot be denied that uncontaminated returns are "liquid gold" — aside from the fact that an equivalent amount of raw make-up will be required anyway.

It is quite possible, and highly probable, that the hook-up was left as it is for a very good reason. May we have the comment of Mr. Baker — a most respected individual in our book? — R. C. BELLAS, Supervisor, Boiler & Machinery Inspection Div., Maryland Casualty Co.

THE AUTHOR REPLIES — I appreciate the comments by Mr. Bellas on my article in the April HPAC.

Mr. Bellas is entirely correct in his statement concerning the recovery of the flash condensate that drains from heat exchangers, referred to in my article. I have always recovered condensate from this source wherever the amount warranted recovery. I greatly appreciate Mr. Bellas' comments — they are most apropos. In some cases of heat recovery, the condensate, because of possible contamination from certain processes, is not suitable for re-use. This, however, is not universally the case. — C. T. BAKER, Consulting Engineer.

BILL DOPP —

"Piping Maintenance Too Often Neglected"

HPAC's publication in the April issue of the report to the American Power Conference on the piping maintenance practices survey, by Robert J. Pinske, is a valuable service to industry. I read it with immense satisfaction. It is very comprehensive and decidedly down to earth. As a longtime advocate of preventive maintenance, I fully appreciate what such a report can mean if taken seriously. It should be required reading for all management and all prospective engineers.

Only long experience in the piping field can bring realization of the terrible waste that the neglect of piping installations costs American industry. Mr. Pinske says that "the remaining 65 percent (of the surveyed plants) have no maintenance policy, except to make repairs when necessary." This indictment of both management and supervision should bring about considerable improvement. Even those having a maintenance policy can well improve their performance by carefully reading this report.

The statement that "the most positive approach to preventive maintenance is through proper design of the piping system" is of course the foundation of all true economy. I've seen plants where the piping was laid out by a carpenter contractor and where no drawings exist to give even a hint of what piping is intended to do. When such a system finally does break down, management is in serious trouble. Large utility plants are designed. Many industrial plants just seem to grow. The piping is too often the most deformed and neglected components of the equipment in the structure.

Strange things happen when a plant is run on the breakdown maintenance principle. In a plant where a new 6 in. line was to pass through a 12 in. line near the ceiling, investigation proved that the latter line, which passed through both end walls of the department, had a blind flange on each end and was entirely empty. Therefore, the purchase of 12 in. pipe had been pure waste.

Frequently, equipment is moved and piping is disconnected, but the mains are left alive. One machine after another is detached from a steam line until the whole thing is out of balance. Then waste really gets bad. In a plant that was thoroughly surveyed, the piping was rebuilt by taking out five carloads of obsolete material which was replaced with less than two carloads of modern piping. The maintenance cost was reduced 80 percent and coal consumption 20 percent.

The author says that some plants have a highly organized inspection system. In a utility plant or a large industrial institution, this is necessary. A small plant can, however, do an effective job by appointing an older member of the maintenance crew whose sole duty it would be to inspect the piping throughout the plant — reporting directly to management. A close watch on joints, valves, regulators and traps will pay big dividends. Regular inspection, prompt repairs and intelligent foresight will do much to eliminate most of the waste that this comprehensive report reveals. — BILL DOPP.

JOHN H. CLARKE —

"Industrial Hygiene Takes Teamwork"

INDUSTRIAL HYGIENE has indeed come of age! Herbert T. Walworth's excellent article in the May HPAC on the struggles and accomplishments of this profession is both timely and interesting. The great recognition which has been accorded this profession in recent years, the mass of informative literature and scientific data produced, and the recent symposiums on industrial ventilation, air pollution, hood design, industrial hygiene and the allied fields is ample testimony to the fine job that has been done.

In the last few years, it has been my privilege to work with a number of men in this field. I have learned a great deal. I have found that they are earnest in their desire to find answers to our most baffling problems of industrial hygiene, and that they are equally practical in recommending corrective measures for these problems.

Mr. Walworth has given proper recognition in his article to the great need for cooperative effort in the field of industrial hygiene. This is most emphatically true. In this scientific age it is still customary for many people in the operating, construction, production and lay fields of endeavor to refer to themselves as being "practical" — while pinning the label of "impractical" on all engaged in scientific pursuits. The dictionary defines "practical" as "being capable of being turned to use or account." Can a person logically contend that the tremendous scientific advances of this age — atomic energy, the miracle drugs and chemicals, the tremendous advances in transportation, the development of intricate "mechanical brains" and similar devices — are the results of an "impractical" scientific approach?

The "practical" man says: "But no scientific development could be used if we didn't build, or operate or sell it." Let's be equally candid on the other side of the picture. The construction men, the operators and the salesmen would be out of jobs and starving if the scientists had not produced the answers and the design information which made their jobs possible (and vice versa.) Thus, as never before, it should be realized that teamwork is essential to our well-being in this day and age.

Many young engineers today are coming out of college under the illusion that there are no bounds to their capabilities. This is extremely unfortunate, and our educators would do well to discourage the view. The "curse" of the engineering and scientific field today is not *over-specialization*, as is often mentioned, but the tendency for unqualified persons to try to do the other fellow's job. We can't all be qualified, experienced engineers, scientists, builders, operators and salesmen all rolled into one. In a single profession, we can't even be all kinds of engineers at once; and in the major engineering fields, a man will do well to keep abreast of the myriad of everyday developments in his own particular line of endeavor.

All of which is just another way of saying that if improved conditions are to be provided in the industrial environment, these can best be provided when the members of the team — the industrial hygienist, chemist, medical man, engineer, construction man, operator, workman and executive — work together cooperatively to find the solutions to the problems.

Congratulations to the members of the American Industrial Hygiene Association (of which Mr. Walworth is the newly-elected president) for their many outstanding accomplishments, and for providing the coaches and many members for this industrial team. — JOHN H. CLARKE, Engineering Supervisor, The Visking Corp.

D. L. GETZ —

"SMA Manual Is Authority on Stokers"

ALTHOUGH THE article in the May HPAC on changes in heating practices and methods during recent years makes reference to certain standards established by other organizations with respect to heating equipment, there is a noticeable absence of any reference to the standards established by the Stoker Manufacturers Association in connection with the sizing, installation and operation of underfeed stokers in commercial and small steam plants. The recommendations and standards contained in the SMA Technical Manual are the main authority throughout the country for the sizing and installation of underfeed stokers.

In the paragraph in the article referring to stokers, I notice a lack of information concerning the fact that forward steps have been taken by some of the major control and stoker manufacturers in designing controls and stoker equipment which can be operated almost continuously rather than strictly on the "on-off" principle. This equipment uses controls and transmissions of the modulating type which regulate the air and fuel feed of the stoker from the demand of the steam plant. This type of equipment is, of course, a step forward in the elimination of excessive smoke, as well as in improving the overall efficiency of the heating plant.

Since the commercial and small steam plant field is an important segment of the heating and processing picture, we hope these comments will be welcome. — D. L. GETZ, Chairman, SMA Engineering and Research Director of Engineering, The Steel Products Engineering Co.

G. M. ROY —

"Excellent Job of Presenting This Problem"

OUR DESIGN Analysis Group read Alfred Amorosi's paper on Piping, Pumps and Valves for High Pressure

Water Reactor Systems (published in the May HPAC) with great interest. He does an excellent job of presenting this problem in its proper perspective.

Although the neutron-gamma reaction with oxygen would not alter his discussion for the considerations in question, it may be worth noting that in many cases this reaction with a 29 second half-life is important, as its activity level crosses the neutron-proton reaction (of 8 seconds) after a short time.

During the next interval it is the dominating source of activity, but since it also decays fast relative to the activity of corrosion products, its consideration in no way alters Mr. Amorosi's conclusions. — G. M. ROY, Reactor Design and Development, Design Section, Engineering Dept., Hanford Atomic Products Operation, General Electric Co.

HERBERT J. WEBER —

"Greatest Investment Is In People"

IN ADDITION to the excellent points Herbert T. Walworth makes in his article on the development of industrial hygiene (published in the May HPAC), I should like to say that it has grown even further than he indicates.

Industrial hygiene is concerned not only with industrial health but with all those things that affect the physical and mental well-being of workers. The human engineering phase of hygiene relates to comfort. It is important to prevent fatigue. Industrial hygienists, while not alone in this regard, are interested in better design so that controls and other parts are within easy access of the operator. This is to prevent the output of unnecessary effort in order to avoid needless fatigue and to effect better production. A tired worker or one who does not "feel good" is inefficient and accident-prone.

Good industrial illumination, especially in the heavy industries, was not generally sold until industrial hygienists pushed it in the interest of better working environment.

Heating systems in foundries were practically unheard of, in my opinion, until industrial hygienists convinced management of the importance of good heating.

In the beginning, the industrial hygienist was first received with suspicion, later tolerated, and now welcomed, since management has come to realize that its greatest investment is in people. — HERBERT J. WEBER, Chief Industrial Hygienist, Medical Dept., American Brake Shoe Co.

J. F. GSCHWIND —

"High Temperature Hot Water Popular"

THE IMPORTANCE of S. A. Kuli's recently published articles on high temperature hot water heating lies mainly in their timeliness and the fact that they point toward the increasing popularity of such systems. It is somewhat disappointing that the author, basing his remarks on German practice, does not indicate any novel developments with reference to European installations made before World War II.

High pressure hot water heating systems were introduced in this country as early as 1936, and there are quite a number of good-sized plants that have been operating in the U. S. and Canada since the early '40's. Technological evolution after the war brought about special applications, such as for temperature control within ± 1 F in the plastics industry, automatic heating and cooling systems, the extended use of synthetic heat carriers for high temperature ranges, the adaptation of forced circulation boilers, etc.

In this country, more than in Europe, particular attention is required to have these systems conform with technical codes, Underwriters' requirements and local ordinances.

Not enough emphasis is generally put on the long life of high pressure hot water installations due to the absence of internal corrosion, the impossibility of wasting heat because of unbalanced heat loads in secondary systems, nor by faulty operation of accessory equipment. Because of its relatively high specific heat content, water is an excellent heat carrier, and the delivery temperature at the end of a long distance main, which may extend for miles, is not a function of the pressure drop. Water mains, furthermore, need not be pitched for drainage.

The nature of high pressure hot water installations requires thorough engineering and good design, together with high quality equipment and workmanship; negligence in the use of either may mean the difference between success and failure.

The savings in fuel and maintenance, the precise temperature control and many other advantages of these completely closed systems assure high pressure hot water heating an ever-increasing field of success. — J. F. GSCHWIND, Manager, Supertherm Dept., J. O. Ross Engineering Corp.

EDITOR'S NOTE —

Piping, Pumps, Valves for Reactor Systems

IT IS regretted that in the paper on piping, pumps and valves for high pressure water reactor systems, by Alfred Amorosi, published in the May HPAC, that the cuts for Figs. 2 and 3, on page 142, were transposed in error.

J. W. TURNER —

"Base Boiler Example on Average Case"

IN MY OPINION, the article on measuring boiler heating surface, published in the May issue, is technically correct.

It is difficult for a man associated with an industry to write a technical article completely without bias when he is comparing a product of his industry with that of a competitive industry.

In this article, the author is comparing two different methods of computing boiler tube heating surface, and he says "the difference in the two systems is considerable and may be in excess of 10 percent. . . ." In his numerical example, he uses a comparison which indicates a difference of 12 percent in heating surface as calculated by the two methods he describes. No doubt the author could select an example where heating surface figured according to Steel Boiler Institute practice was 12 percent greater than that figured according to ASME practice. However, investigation would show that a very large percentage of boilers with heating surface cataloged on the Steel Boiler Institute basis use 3 in. No. 12 ga tubes. For fire tubes of this size the fire side surface is not even 8 percent smaller than the water side surface.

I think the article would be more representative of average practice if the numerical example were based on an average case rather than on a case which is more nearly extreme. — J. W. Turner, Heating Boiler Subcommittee, American Society of Mechanical Engineers.

Reply by the Author — In my article, I attempted to state the average difference that can exist between measuring heating surface by the ASME method and the SBI method with the sentence "the difference in the two systems is considerable and may be in excess of 10 percent. . ." It is true that the numerical example used indicates a differential of approximately 12 percent, but throughout the 17 boiler sizes that we manufacture, the heating surface measurements on the SBI method are more than the ASME method by from 8 to 12 percent.

While the example in my article may not be an average one, it does illustrate the great variance that can be encountered in actual practice. — Robert C. Gray, Orr & Sembower, Inc.

ARTHUR J. HESS —

"High Temperature Hot Water Article Timely"

The article on high temperature hot water, by S. A. Kuli which was published in the January HPAC, is indeed interesting and timely. Mr. Kuli surely establishes a good foundation for future articles on this subject. It is the feeling of many in our field that American engineers have, as a group, failed to take advantage of the economies and flexibilities offered by the installation of high temperature hot water heating systems. Perhaps this condition exists because many engineers still think of hot water heating in terms of the old gravity type of system with the larger piping systems that were required.

Of course, the old type of heating units were not able to stand even moderate pressures, so the temperature of the water was usually about 180 F in these systems. More modern heating devices, such as convectors and unit heaters, have changed these old limiting factors. This article, being of a general nature, invites little specific discussion. However, there is one comment that I would like to make.

In the discussion on control of temperatures by varying pressures, as opposed to mixing return and supply water, one most important reason for using mixing instead of variable pressure is that control valves operating at the constant pressures of this type system will perform much better.

It is hoped that more information on high temperature hot water heating will be published in HPAC soon. If this is the plan, it is my suggestion that the future articles discuss the so called medium pressure systems that use automatic low pressure (30 psig) water boilers. These boilers require only moderately trained semi-skilled operators, and a considerable saving in operating cost can be achieved. Much ingenuity and experience is required in designing the piping for these medium temperature systems. It seems to me that Mr. Kuli is well qualified to educate us along these lines.

Though we recognize that the European engineer is ahead of us in knowledge and experience, there are quite a few systems of the high temperature type in operation in the west. — Arthur J. Hess, President, Hess, Greiner & Polland, Inc.

R. J. HOUKAL —

"Heat Pumps Feasible Only in Some Areas"

I have the following comments to make about the article, Heat Pumps Go To School, which was published in the December HPAC:

It is thoroughly covered that this installation is in the south, and no claim is being made for using this type of installation anywhere but in the south, as far as I know.

In checking over the assumed fuel costs, I question the 14c per gal of oil for a school inasmuch as our practice is to use No. 5 oil and, wherever possible, No. 6 oil, both of which sell for less than the 14c, which seems to be the price of No. 2 fuel oil. I also question the electric rate which does not take into consideration any demand charge or excess facilities charge. It may be that the utility, in the interests of promoting the heat pump, is not making these charges — or at least not now.

The question of maintenance is also one to consider, and I feel that there will be more cost involved in maintaining a system of this type than with the ordinary system.

There is no question in my mind that the possibility of using this equipment for air conditioning of certain areas is a very important factor and no doubt has a great deal of bearing on the selection of the heat pumps for these installations.

The article also mentions that the original cost was reasonable, but it does not mention just how reasonable compared to the normal heating system.

My conclusions regarding the heat pump are that certain areas are in the United States where this type of system can be installed and has proved economically feasible; however, I don't feel that this type of system can be too seriously considered in the greater portion of the United States at the present time as long as electric rates are what they are, and particularly where the heating load is extremely high and whatever cooling necessary would be of extremely short duration. The capital investment would be too difficult to justify unless the public areas were used the year around.—R. J. Houkal, Perkins & Will, Architects and Engineers.

W. W. REASER —

"Air Conditioning for Aircraft a Challenge"

The Article by E. P. Heckel on air conditioning high speed, high altitude airplanes, published in the May HPAC, seems to be timely in succinctly pointing out the problems that aircraft air conditioning engineers are encountering.

In the discussion on radiation shielding from the high skin surface temperature, it is stated that some degree of insulation and/or radiation shielding will be required. This is, of course, true wherever possible.

Unfortunately, the operating crews must see out of the airplane, which of course means many transparent areas that present a very difficult problem. Increased velocities of cooling air over the subjects seated next to these areas have been one solution for a fighter type of aircraft; however, the high velocities would make it unsuitable for a cockpit of an airplane where the crew does not wear special helmets. The problem, therefore, remains a challenge for the air conditioning engineer to solve. — W. W. Reaser, Chief of the Air Conditioning Section, Engineering Div., Douglas Aircraft Co., Inc.

ANOTHER CASE OF *Copper* WHERE IT COUNTS

4,800 FEET OF TYPE "L" REVERE COPPER WATER TUBE, IN SIZES FROM 1" TO 6" USED IN AIR CONDITIONING SYSTEM OF U. S. Fidelity and Guaranty Company Bldg. Baltimore, Md.

Take a good look at the two photographs below. Then visualize this same installation made with threaded fittings and think of the time that would have been consumed running these lines. No wonder more and more copper tube is being used for air conditioning, water and waste lines.

You don't have to worry about wrench room in the tight corners, solder joints are made much faster, present a much cleaner appearance. And you need never worry about replacing copper tube due to rust, for copper can't rust. There is no loss of flow or pressure, no allowance in pipe size need be made for rust accumulation with Revere Copper Water Tube. There are fewer fittings, too, on the long runs, as Revere Copper Water Tube comes in straight lengths of 20′ in hard and soft tempers and 60′ coils in soft temper. It's easy to bend, too.

Keep out of trouble, protect your reputation for quality work, with copper. Use Revere Copper for air conditioning lines, radiant panel heating, hot and cold water lines, underground service lines, waste stack and vent lines, processing lines. See the Revere Distributor nearest you today. And, if you have a technical problem, he will put you in touch with Revere's Technical Advisory Service.

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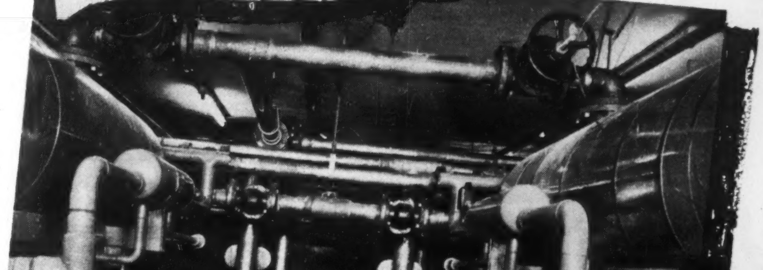
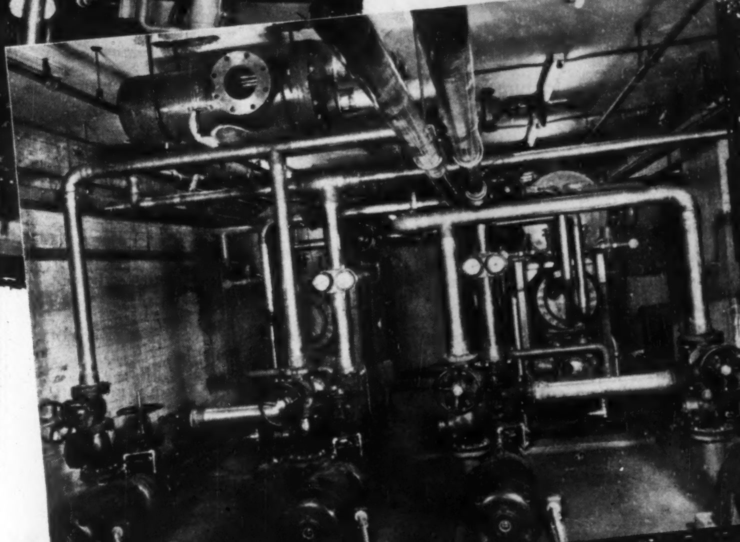


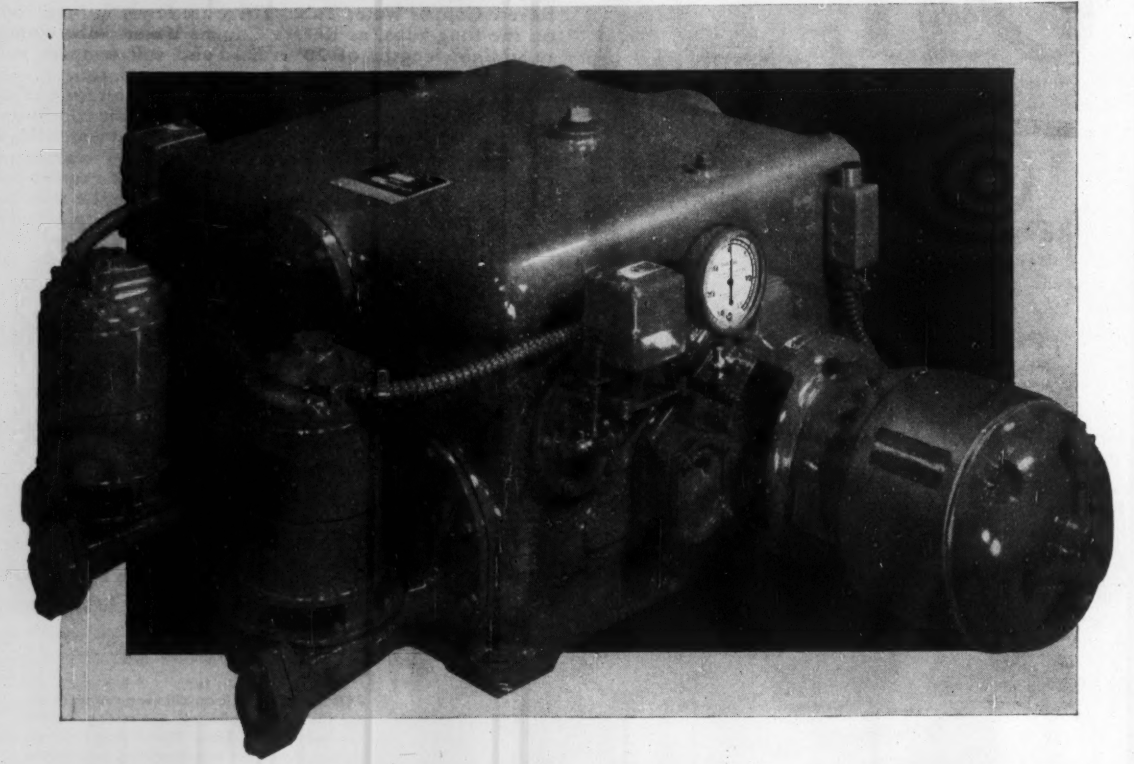
(Above)
REAR VIEW of system which air conditions the entire building of 9 floors, and has a capacity of 150 tons. Cooling tower is located on roof. System was completely installed by H. E. CROOK COMPANY, INC., Plumbing, Heating, Electrical and Air Conditioning Contractor. Tube was supplied by Revere Dist., J. T. ROBERTS & BROTHER, INC., both of Baltimore.

(Below)
FRONT VIEW of air conditioning system showing the neat-appearing, non-rusting Revere Copper Water Tube. Photo shows system before it was put into operation and before cold water lines were insulated.



THIS NEW VACUUM HEATING PUMP

HAS THE INCREASED AIR CAPACITY EFFICIENT HEATING PRACTICE DEMANDS



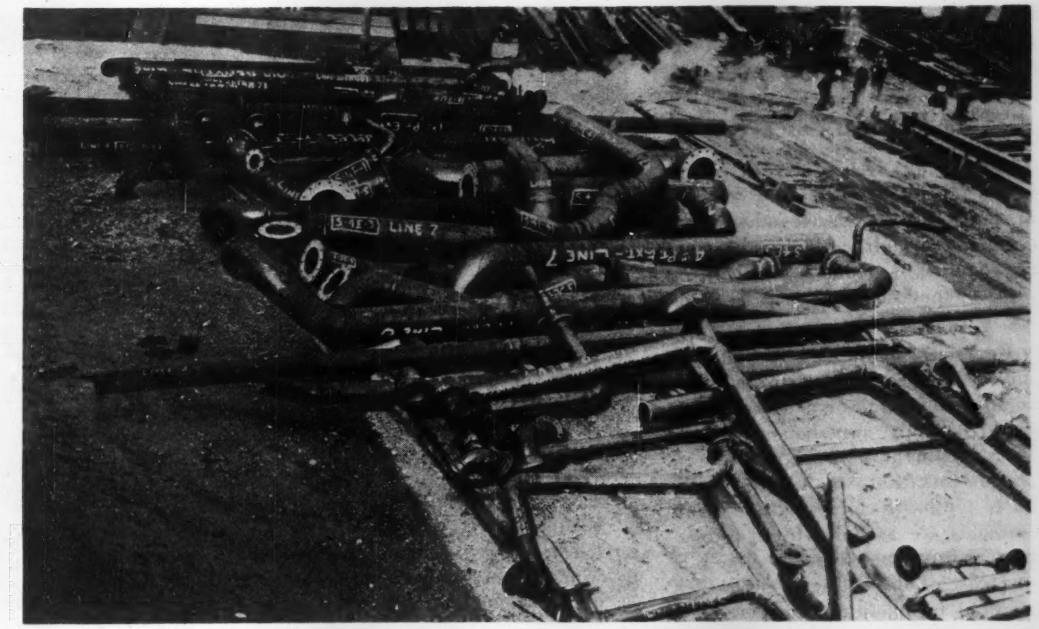
It's the Nash CSM

Designed and manufactured by the organization that made the Jennings Manifold Heating Pump standard of the Heating Industry, the new CSM incorporates every desirable feature architects, engineers, owners and operators have sought. Employing separate air and water pump elements, each with its own motor and each independently controlled by its own automatic switch, the capacities and arrangement may be widely varied to meet job conditions. For the first time, the engineer has the choice of realistic water and air capacities required for rapid system response without wasteful overheating.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- ✓ **Increased air capacity induces rapid system response without wasteful overheating.**
- ✓ **Separate air and water pumps individually selected to meet actual job requirements.**
- ✓ **Control system that operates individual pumps only when needed.**
- ✓ **Flexibility permitting addition of radiation without changing basic pump installation.**
- ✓ **Low, low, return line connection.**

NASH ENGINEERING COMPANY
437 WILSON, SO. NORWALK, CONN.



ALL PIPING SYSTEMS are custom-built since they consist of lengths of pipe and fittings, valves and accessories joined by some method at the job site to form the completed system

How To Estimate Field Fabricated Piping Costs

• Estimating piping costs has always been a problem to the piping designer, estimator, supervisors and contractor even though formulas, tables, graphs and charts are available for such items as handling costs, beveling time, fit-up time, etc. Here, cost measurements were made on an actual installation and the results are presented and compared by application in typical example.

By T. R. Christian
Piping Supervisor
Stone & Webster
Engineering Corp.

ORIGINAL PURPOSE of this cost study was to establish a simple and accurate method of estimating piping costs for a particular power piping system in a 30,000 kw steam generating station in the midwest. Near the completion of the study, it became evident that many of the factors involved are common to other segments of the piping field. This article has been prepared with the thought in mind that the information will be of value to piping designers, estimating engineers, supervisors, cost men and contractors who are faced with the task of estimating the costs of piping to be fabricated at the job site. Hence, the original tables and charts have been simplified and condensed — without loss of accuracy — for presentation here so that they may be used in other estimating applications.

How Much Will It Cost?

All piping systems are custom-built since they consist of lengths of pipe and fittings, together with such valves and accessories as may be required — joined together by some method at the job site to form a completed system.

Regardless of the fact that all piping systems must be custom-built, components of the systems can be and frequently are shop produced. It is in these field-shop produced components that we are interested here. Charts, tables, graphs and formulas are available to an estimator covering such items as the rate and cost of depositing a cubic inch of weld metal, fit-up time, beveling time and handling costs. This bewildering array of information often is extremely difficult to assemble and may give doubtful results. To those charged with the responsibility of determining the costs of fabricated piping, one question is of great importance. It is: "How much will it cost from the time the piping materials leave the storage area until they are back in a storage area as finished fabrication?"

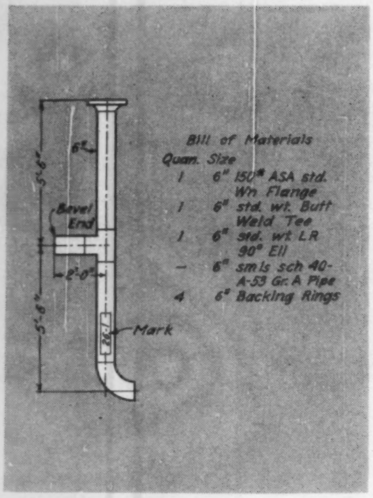
Establishing the Conditions

First, let us establish the conditions under which the piping covered by this report was fabricated, since the information given would be of value only if the same class of piping were to be fabricated under similar circumstances. The most prominent conditions that should exist in order for this information to apply are listed below.

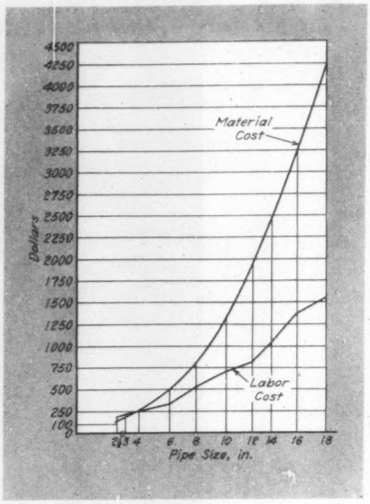
a) The piping is to be fabricated to conform with the latest revision of the ASA Code for Pressure Piping, Section 1, Power Piping Systems, which covers steam generating plants, central heating plants and industrial plants.

b) Fabricating will be done in a field shop, set up more or less temporarily to fabricate for one job or area as against a contractor's permanently established fabricating shop.

c) The tools and equipment used are to be of the ordinary type associated with field fabricating and erecting of welded piping systems. Additional information will be presented later in the article. It is assumed that no elaborate equipment is available.



1 PIPING DESIGN should be complete and fabrication sketches with a bill of material listed thereon should be provided for each assembly



2 THE RELATIONSHIP between material costs and labor costs for fabricating a 100 ft composite line of different diameters of pipe is shown here

d) The pipe and fittings, along with the finished fabrication, should be stored in an area near the fabricating shop — less than 100 yd.

e) An overhead lifting device should be provided in the fabricating shop for handling the heavier pipe and fittings, and equipment should be available for moving the pipe and fittings from the storage area to the shop and to remove the finished fabrication from the shop.

f) Piping design should be complete and fabrication sketches with a bill of material listed thereon should be provided. A sample of such a sketch is shown in Fig. 1. Fabrication sketches pay for themselves many times over in the quantity and quality of the work one can expect from the shop. The Pipe Fabricating Institute's Standard ES-2-1949 *Method of Dimensioning Welded Assemblies* is an excellent guide in preparing these sketches.

g) Experienced welding operators capable of passing the tests as outlined by the code should be employed for the work, along with such pipefitters as may be required.

h) Some or all of the nominal pipe sizes — 2½ in. through 18 in. — in standard weight pipe will be fabricated.

Defining the Terms

To avoid confusion, certain terms that are used herein are defined:

Pipe: Standard weight, seamless, ASTM Spec. A-53 Gr. A, Sch 40 in sizes 2½ in. through 12 in. and Sch 30 in sizes 14 in. through 18 in.

Fittings: Standard weight, butt welding, ASA b.16.9.

Flanges: 150 ASA Std. weld neck.

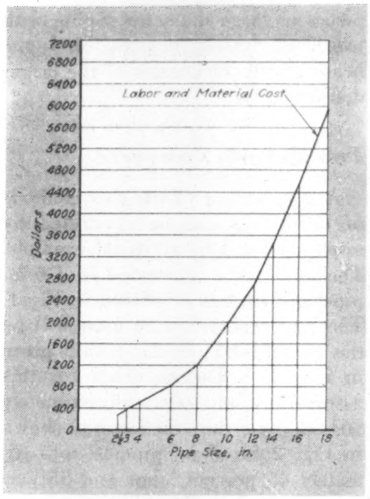
Backing Rings: Groove style, wih 3/16 in. knockoff spacer pins used at all welds except weld neck flanges.

Cutting: Flame cut by manual operation of oxy-acetylene cutting torch.

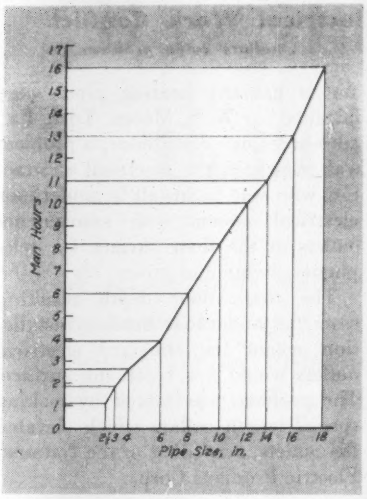
Bevel: A 37½ deg angle bevel with 1/16 in. land, obtained by torch cutting, grinding with a portable grinder and such hand filing as may be required.

Shop Weld: Generally speaking, a weld made in the horizontal rolled position, although perhaps 10 percent of the welds were in horizontal fixed or vertical fixed position. All welds were of size and type to conform to code, and were made with ⅛ in. and 5/32 in. AWS E-6010 filler rod by the manual arc process.

Shop Equipment: This consists of 300 amp portable electric motor driven dc welding machines, a 1½ ton



3 THE TOTAL LABOR and material costs for fabricating a 100 ft composite line of various pipe diameters is given here



4 THIS CURVE gives the total man-hours required for all operations to make one weld in a field-shop fabricated piping system

truck with an A-frame mounted on the rear — available part time for handling piping materials to and from the storage yard — several portable power grinders, compressed air, a chain hoist mounted on a monorail in the shop to handle heavy pieces, welding clamps, steel horses with adjustable rollers, and the usual hand tools such as scaling hammers, cold chisels, files, levels, squares and wire brushes.

Labor Costs: These costs include direct labor costs which consist of the actual amount paid to the foreman, welders, and pipefitters. The labor costs do not include any form of overhead.

Material Costs: These costs include the total cost of all pipe, fittings and flanges used in the work. Other costs that this includes are freight, the handling of materials at the job site, welding electrodes, oxygen and acetylene. This does not include depreciation of tools and equipment, or the cost of power, lights, and heat.

Only Direct Costs Used

Perhaps the description of the labor and material costs should be expanded so that the figures taken from the charts could be adjusted to fit varying conditions and pay rates encountered in various localities. It should be noted that only direct costs are used, since overhead costs vary widely from one organization to another. Also, they are generally some flat percentage of the direct costs, and therefore, they may easily be added to give a correct total. It is obviously impossible to attempt to chart such overhead. Hence, only the basic costs are used that will occur on any and every fabricating job.

The labor costs given on the charts are based on a wage scale of $3.00 per hr paid to welders and pipefitters and $3.25 per hr paid to foremen on the job. These rates were the scale when the highest rate paid in the 20 principal cities of the U. S. was $3.67 in New York and the lowest was $2.75 in Minneapolis. The average rate at that time in the 20 cities was $3.08. Thus, the labor rates closely reflect the national averages.

Concerning the efficiency of the workers employed, it should be noted that the welding operators and pipefitters engaged in this work were men of widely varying ages, backgrounds and geographical origins. Over a long period of time, a surprisingly small difference was noted in the output of the various fabricating teams. This fact is an indication that the averages shown in the charts are very close to the average quantity of work to be expected from any group of welders. It is necessary, of course, to assume that the welders are capable of passing the code tests and that the experience level of the pipefitters is equivalent to that which one could expect near any principal city. Of course, the larger the group of workers, the less the average would vary. Test runs on fabricating piping systems using different fabricating teams after the major portion of the data was gathered proved the charts to be accurate within narrow limits on this power piping job.

The material costs shown are based upon 1953 and early 1954 prices paid for the pipe, fittings, flanges, rings, oxygen, acetylene and electrodes, including the handling of all material at the job site. These costs represent those paid when buying in large quantities — for instance, several thousand feet of pipe and several hundred fittings from various suppliers with the usual trade discounts for quantity purchases. Of course, any installations far removed from the source of supply would have higher freight rates.

Material-Labor Method

There are several time-honored methods of estimating the cost for fabricated piping. Two much used systems are the material-labor relationship — used when the cost of the material is known — and the other is an estimated cost based upon the complexity of the pieces to be fabricated.

First, we will examine the material-labor relationship. Once an estimator has the sketches for a particular system, all he needs to do is to total the bills of material, add the cost of electrodes, oxygen and acetylene, enter the prices for the material and thus determine the total cost of the materials required to fabricate that system. The relationship between the material costs and labor costs for the different diameters of pipe is shown in Fig. 2. To establish a basic relationship for the various nominal pipe sizes, a composite line was set up, and the quantity of pipe and kind of fittings was determined by averaging all of the fittings and pipe purchased so as to give an average piping system. The curves in Fig. 2 are not intended to give exact costs for every 100 ft of pipe to be fabricated. The pur-

Radiant Heating Pipes, Electrical Work Conflict

. . . collars solve problem

SPECIAL COLLARS elevate outlets for underfloor electrical system, solve the problem presented by the extra floor depth due to the floor heating pipes

WHEN RADIANT heating pipes were installed for W. S. Moore, York, Pa., auto accessory distributor, a problem was presented the electrical contractor, who was to install in underfloor electrical system with convenience outlets at the floor surface for telephones, lights and power.

The extra floor depth resulting from the underfloor heating installation meant the standard electrical outlets would not reach the surface. The problem was solved by making special length collars which elevated the outlets, according to the National Electric Products Corp.

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pose and intent of Fig. 2 is to show the distribution and relationship between labor and material costs on lines of different diameters when they are composed of the same materials in an average system.

The total costs of fabricating the materials are shown in Fig. 3. This curve should be of particular interest to piping designers, because it shows the steep rise in costs in the larger diameters, which serves as a caution to carefully weigh each decision before using the next larger diameter. The relationships shown in Figs. 2 and 3 also indicate the folly of attempting to use some flat percentage of material costs to arrive at labor costs. In the case of a 2½ in. line, the labor costs were found to be more than the material costs, while the labor cost on the 18 in. line cost less than 1/3 as much as the materials. It is understood that both sets of curves include all of the labor and material costs from the time the materials leave storage until they are back in storage as assemblies.

Costs Are Related to Welds

The second and preferred method of estimating is based upon the quantity of work that must be performed to fabricate the various sections of the system. All of the operations required for any given piece of fabrication can be related to the number of welds. Obviously, if a 20 ft length of pipe is to be used during erection in some straight run, it would not be necessary to move the pipe to the shop, and therefore, no fabrication labor would be charged to the piece. However, if the same pipe were to be used in short lengths, considerable labor charges would result. Thus, the cost of labor will be in direct relationship to the number of welds. Some welds in parts of the fabrication will of course consume more time than others. Also, when welding fittings to fittings or fittings to flanges, certain operations such as beveling are not required. Nevertheless, the *average* time required for a large number of welds can be forecast very accurately.

The total man-hours required for all operations to complete one weld on shop fabricated piping for pipe sizes from 2½ in. to 18 in. is given in Fig. 4. In using the curve in Fig. 4, all that needs to be done is to count the shop welds given on the fabrication sketches and multiply them by the man-hours shown in Fig. 4 to determine the total man-hours required to fabricate the system. These man-hours include all of the following operations: moving the material to the fabricating shop, cutting and beveling — including beveling for field welds — fit-up on backing rings, tacking, welding — in horizontal rolled position where possible — lining up, shop cleaning and finally moving the piece to the storage area. A 10 percent allowance is included in Fig. 4 for a foreman not actively engaged in handling the pieces. The "humps" that appear in the cost line at various points are caused by the higher costs that are due to the additional time required for handling the heavier pieces of large diameter piping with overhead lifting devices, and the heavier wall thicknesses of the larger diameter pipe.

Two Methods Compared

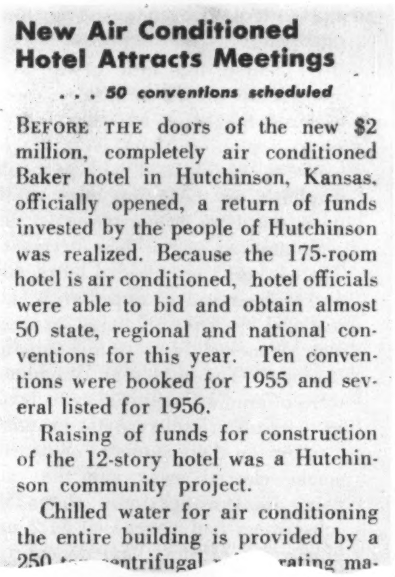
A comparison of the two methods of estimating can be illustrated by applying them in a typical example. The piece to be fabricated is of 6 in. pipe and fittings as shown in Fig 1. The first method to be used will be the material-labor relationship given in Fig. 2. The materials for this assembly would cost approximately $64.00, and the relationship shown in Fig. 2 for 6 in. pipe is approximately 45 percent labor and 55 percent material. Therefore, the labor cost would be $52.00 and the total cost of the piece would be $116.00.

Using Fig. 4 in the second method of estimating the cost of fabricating this piece, the five 6 in. welds would require 20 man-hours. Based on the rate of $3.00 per hour, the labor cost would equal $60.00, or the total cost for fabricating this piece by the second method would be $124.00.

As previously stated, Figs. 2 and 3 will not give consistently accurate results for every assembly of 100 ft of fabricated piping, and they are shown only to illustrate the relationship between labor and material costs. However, the above example indicates that perhaps they could be used with fairly accurate results under certain conditions.

Additional Data Desired

In the course of this study, many questions have been found to remain unanswered. Many of these are in the field of employee-job psychology, and they require a great deal of further study by those trained in this field. It is in this area that perhaps the greatest production advances may be made in the future. Some of the data collected for this cost study showed inconsistencies that could only come from day to day and week to week variations in the work of individuals. No apparent reasons existed for such variations. Production would sometimes run counter to the conditions experienced. It is hoped that other studies now being made on this subject will provide additional information that will be of benefit to the entire piping field.



New Air Conditioned Hotel Attracts Meetings

. . . 50 conventions scheduled

BEFORE THE doors of the new $2 million, completely air conditioned Baker hotel in Hutchinson, Kansas, officially opened, a return of funds invested by the people of Hutchinson was realized. Because the 175-room hotel is air conditioned, hotel officials were able to bid and obtain almost 50 state, regional and national conventions for this year. Ten conventions were booked for 1955 and several listed for 1956.

Raising of funds for construction of the 12-story hotel was a Hutchinson community project.

Chilled water for air conditioning the entire building is provided by a 250 t[illegible]ntrifugal r[illegible]rating ma-

THIS ITEM in the May HPAC announced the opening of the new air conditioned hotel

How Hutchinson Built a Hotel

A short news item in the May HPAC announced the opening of the new air conditioned Baker hotel in Hutchinson, Kansas. Here's the unusual and interesting story behind this example of civic enterprise

By Esther Bush

Secretary to Harry L. Stevens
Stevens, Inc.
Heating and Air Conditioning Contractor

HUTCHINSON is an industrious Kansas town, situated almost in the center of the United States. It is principally dependent upon agriculture, but industry runs farm products a close second and the production of salt, plows, airplanes, flour, strawboard, etc., helps Hutchinson maintain an even keel and avoid the extreme economic peaks and valleys of the national average.

Early in 1944 — during World War II — the community feared that, at the end of the war, thousands of young men returning from military service would face unemployment unless steps were taken to provide jobs for them. As a result, a postwar planning committee was appointed with instructions to study and promote projects for Reno county and its county seat, Hutchinson, which would provide employment for its returning service men. Harry L. Stevens was asked to serve as chairman of this committee. Mr. Stevens, together with his brothers Charles and Jack, operate Stevens, Inc. — which has been serving the heating, ventilating, air conditioning and plumbing needs of Hutchinson and western Kansas for more than half a century.

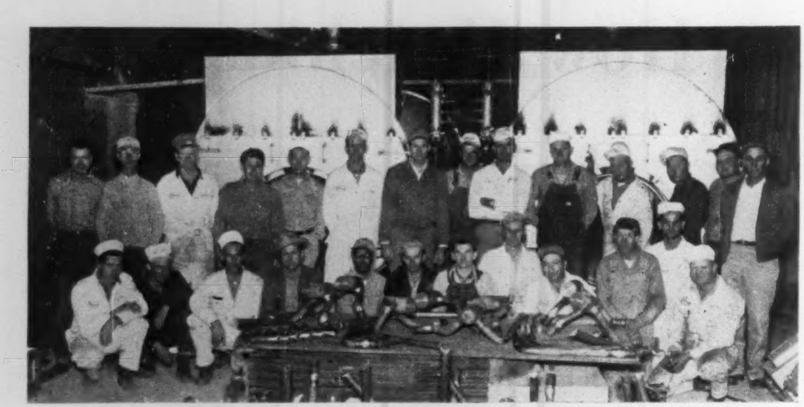
Possible Projects Listed

The committee prepared a list of the needs and possible projects for the area, resurrecting many old Chamber of Commerce dreams. The list was long and represented an expenditure of many million dollars. The committee struggled with the problem of selecting a few projects from the list which would be most logical and feasible, and provide the most employment. The committee finally decided to ask the people for their opinion.

But how? Through the cooperation of Jack Harris, publisher of the Hutchinson *News-Herald*, a great deal of publicity and explanation was given each item of the project list. A ballot was printed and delivered to — and collected from — the subscribers by the newspaper carrier boys. To the amazement and confusion of the committee, the people indicated by this unofficial referendum that they wanted *all* of the projects.

MR. STEVENS contributed his efforts, time and many talents untiringly in leading the community in this enterprise

The list contained such items as an elaborate program of flood control, an immense new sports arena, the modernization and remodeling of the existing convention hall, a school buildings program (including several new buildings and the modernization of many others), a plan to acquire and establish several large municipal parking areas in the downtown district, a new airport terminal and other airport improvements, an expanded park program, re-routing highways, a new county home, railroad and street grade separation and the opening of closed streets, a sizable sewer expansion program, the



SOME OF THE EMPLOYEES of Stevens, Inc., pose for a photo in the hotel's boiler room

AIR CONDITIONIN

THE TRUCKS owned by the Stevens organization feature air conditioning

building and establishment of additional fire stations, a new municipal swimming pool, municipal tree care, a municipal garbage and trash collection system, a supervised recreational program, a new public library, new railroad stations, a housing project and a new convention type hotel.

The Citizens Vote

With the cooperation of the governmental offices involved, machinery was promptly set in motion to present bond elections for all of the projects which could be financed with tax funds. The citizens supported their unofficial referendum voice with their vote at the polls — and today, less than 10 years later, every one of the items mentioned has been completed or is in progress. Each one of these listed projects was pushed through to completion by the "stick-to-itiveness" of Mr. Stevens, who spearheaded every drive.

Three of the listed projects, however, were not eligible for public funds and presented a problem. These required some special efforts.

The railroads have cooperated nicely on new railroad stations, with two completed and another authorized.

Although Hutchinson industry had participated in many war contracts, and a naval air station had been located in Hutchinson, the people of Hutchinson opened up their homes and absorbed the increased population so well that the authorities declined to authorize a housing project. A housing project was desirable, however, and would be more critically needed when the service men returned. So 80 town "boosters" met in a suburban cabin, raised $100,000 among themselves, borrowed $1 million, and built Garden Plaza. It is serving the town well now.

How Build a Hotel?

So far so good — but the big headache still confronted them. How to go about getting a hotel built?

Leading hotel operators were invited to build a hotel in Hutchinson. No luck. A scheme to secure the passage of a bill in the state legislature allowing the city to vote bonds to underwrite the hotel was considered. Attorneys vetoed the idea.

Finally the same 80 Hutchinson boosters met in the same suburban cabin. Inspired by the now famous suggestion made by Jim McVay (whose family has operated taxicabs and race horses in Hutchinson as long as anyone can remember) the group evolved a plan. Jim said, "Lock the door, and open the bar, and we'll figure out a way to build this hotel."

Of course, this little group could not put up the $2 million necessary to build the hotel, but they did develop a plan. Many civic minded workers were enlisted, with particular emphasis on the young men of the town, until an organization of several hundred people was developed. The workers were divided into teams, and trained and equipped with sales material. The publicity program was launched and the campaign started. The people of Hutchinson were offered an opportunity to invest in their town and were not promised a return on their money. When the smoke cleared away and the campaign was finished, more than 2500 subscribers had purchased $1.2 million worth of stock and debentures. A contract for plans and specifications was negotiated with McCrackin & Hiett, a local architectural firm. McCrackin & Hiett then associated with the architectural firm of Neville, Sharp & Simon, of Kansas City, and the engineering firm of Howarth, Scott & Kinney, also of Kansas City. Plans and specifications were prepared and contracts awarded.

Air Conditioned Hotel Opened

Two problems remained — an $800,000 loan and an operator were needed. Many lending agencies and hotel companies were contacted. A deal was made with the owners of the Baker hotel, in Dallas, who not only furnished the additional funds required to build the hotel but took over the operation, organizing a new company and issuing debentures to the subscribers in the exact amount of the original subscriptions. This fine new structure was completed and the hotel opened with great fanfare on February 13. Of course, it is air conditioned.

As of the opening date, the Chamber of Commerce had booked 54 conventions for the balance of the year and more have been booked since. The opening of the new Baker hotel equipped with an abnormally large amount of public space in the form of banquet rooms, private dining rooms, shops, etc., for the use of the public and the Chamber of Commerce (which, incidentally, has its headquarters in the new hotel building), marks the virtual completion of a

10 year program of community spirit that challenges the progressiveness of any community in the country.

Mr. Stevens has been active for many years in civic affairs, helping to promote many civic improvements. Frequently, these improvements include mechanical contracts, but Stevens, Inc., does not always land the work. However, in the case of the hotel — after having helped develop and sell the idea, search for and secure a loan and an operator, collect the subscriptions, and serve as vice president of the hotel corporation — when the bids were opened Stevens, Inc. had offered the lowest bid for the mechanical contract.

Heating, Cooling Methods

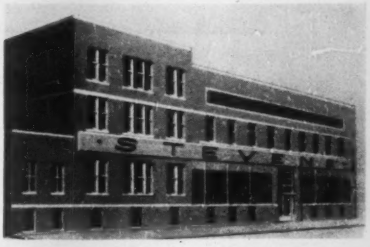
Steam is provided for the laundry, the kitchen, water heating and the space heating system converter by two 150 hp high pressure scotch marine boilers. Chilled water for cooling is provided by a 250 ton centrifugal compressor. Chilled water and warm water are circulated to the various distribution units throughout the building under the control of automatic change-over devices.

All of the public spaces — such as the coffee shop, dining room, banquet room, private dining rooms, meeting rooms, shops, offices, lobby, barber shop, etc. — are served by individual fan-coil units through acoustically treated and insulated ductwork and modern outlets. Each unit has its individual supply of outside air.

Outside air for the guest rooms is supplied through a central fan-coil unit where it is filtered, humidified, tempered or chilled (as the need may require) and delivered under high pressure through a conduit system to jets or orifices in the individual units in the guest rooms. The jet action of the primary air induces the circulation of room air through a water coil in the room units. Warm or chilled water is circulated through the coil and the room temperature is controlled by means of a water bypass valve which automatically switches from the heating to the cooling cycle. Although the central primary air unit is designed to satisfy the dehumidifying requirements, a condensate drain is installed from each of the guest room units. An advantage of this type of system is the ability to do a substantial amount of cooling in an overcrowded room by means of the primary air during the heating season.

Contractor Is Resourceful

From the third to the 11th, the floors are typical. The Stevens organization exhibited resourcefulness by fabricating light plywood templates that could be moved from floor to floor as the forms were set to establish sleeve, partition and equipment locations. This scheme resulted in the unique experience of no misplaced sleeves and no confusion in setting equipment.



THE STEVENS building is served by a railroad sidetrack, which is not shown here

Another interesting procedure which centralized the installation operation and saved many trips for men up and down ladders, temporary stairs and hoists, was worked out whereby *all* risers of all kinds were fabricated and made up on the lower floors and hoisted through their respective sleeves.

In other words, the 12th floor section of the riser was made up and raised through the first floor sleeve, then the 11th floor section was attached and the assembly raised the equivalent of a floor height. This continued until the entire riser was assembled, all of the work being done on the first three floors.

Planning for Safety

. . . avoids hazards

It's hard to teach old dogs new tricks, especially in the construction industry, said Erwin N. Ziner, safety engineer of the John A. Volpe Construction Co. at the recent meeting of the National Safety Congress.

Enforcement of safe practices in building construction is particularly difficult, he declared, because of hand-me-down construction habits, prejudice against safety equipment, and the fact that few contractors have an organized accident prevention program. Transient workers also provide difficulties.

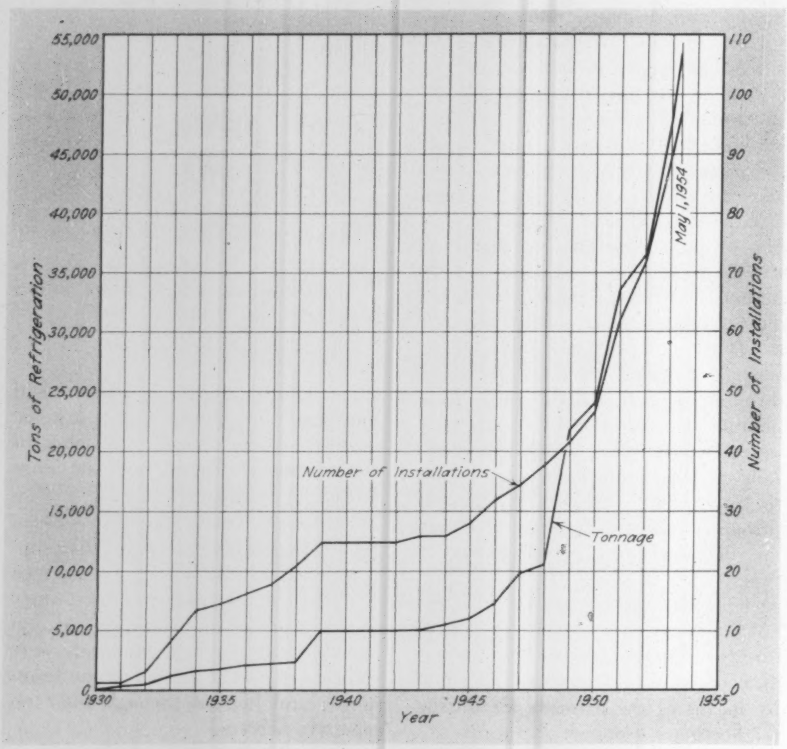
The lack of teeth in any enforcement program has been overcome in his own company, he said, by a bonus system in which large sums of money are given to superintendents and foremen who keep the best records.

Lack of pre-employment physical examinations was cited as probably the most important difficulty. He urged both management and labor groups give serious consideration to the establishment of some sort of basic standards.

Purging Gas Lines

A nonpolitical type of "purging" — having to do with the operation of natural gas systems and designed to eliminate hazard to life and limb — was explained by H. L. Stowers, chief engineer of the Texas Gas Transmission Corp. as "the act of replacing the atmosphere within a pipe line by an inert substance in such a manner as to prevent the formation of flammable mixtures."

When repairs or replacements are made on a gas line, purging is necessary before it is put in operation again. On cross-country transmission lines where exposure of life and property is very limited, a volume of air is used to clear the line. In industrial or residential areas, an inert substance is inserted between the gas and the air. Inerts used include nitrogen, carbon dioxide or steam and water under certain conditions.



THE TREMENDOUS GROWTH of steam air conditioning in New York City since 1930, shown here, has exerted a marked effect upon the steam mains of the Consolidated Edison Co. of New York, Inc., especially the last four years

District Heating Progresses

. . . in the last 25 years

By John F. Collins, Jr.
Secretary-Treasurer, of NDHA

• In this interesting review of the progress of district heating during the last 25 years, Mr. Collins shows that steam consumption has doubled, and tells how operating efficiencies have been increased. Changes in piping methods are reviewed, and the development of different conduits is traced. The determination of steam rates, metering the steam and generating as well as utilization are covered.

PROGRESS in district heating over the last 25 years has been steadily upward — but in varying amounts — from year to year. The expansion activities of the heating utilities were greatly curtailed first by the depression of the early '30's and again by World War II in the '40's. However, since the close of the war, the advances have been more spectacular. These increases cannot be solely attributed to new utilities entering the business, but it is the result of old companies expanding and serving customers that were not being served prior to 1929.

One of the ways in which the growth of the district heating industry can be shown is by an examination of comparative statistics for the 10 largest heating utilities for the years 1928 and 1952 — the latest year for which figures are available at this time.

In 1928, these 10 largest companies sold 19.52 billion lb of steam. By 1952, the figure had risen to 38.25 billion lb, a gain of 96 percent. The investment in these companies also increased almost 100 percent. In 1928 these 10 utilities had 7617 customers. In 1952 they had 10,180 customers, which represents a gain of 41 percent.

Steam Losses Reduced

The operating efficiency of the systems has greatly improved since 1928. Of the 24.26 billion lb of steam produced in 1928, only 80.5 percent reached the customers' meters to be sold, but of the 43.88 billion lb generated in 1952, 87.2 percent was registered by the customers' meters.

By improving the operations in the 25 year period so that 87.2 percent, instead of 80.5 percent, of the steam generated in 1952 — 43.88 billion pounds — was sold, the saving in 1952 was 2.94 billion lb. At $1.50 per thousand lb this was a saving for that single year of $4.41 million. These savings directly reflect the value of the research that has been conducted on the subject of steam losses.

A constant challenge to the officials of the heating utilities has been the inherent low load factors of the district heating business. The companies must have the steam capacity to supply the demand when it is the greatest in midwinter, plus some factor of safety for emergencies. During the milder weather of spring and fall — and especially in summer when there is no space heating load at all — the equipment is almost idle. When the load factor of a company is improved, it is usually the result of securing more all year 'round business, such as industrial processes or summer load such as air conditioning. There also has been progress in this field. In 1928, among the 10 largest steam utilities, the highest load factor was 30.3 percent. However, in 1952, the highest load factor had increased to 38.1 percent.

Steam for Air Conditioning

Steam jet refrigeration equipment was used as early as 1918 for industrial cooling, but it was about 1931 when such equipment was first employed for summer air conditioning. In 1934, Sterling S. Sanford, of The Detroit Edison Co., wrote that there were at least 41 installations in use or under construction in the country, totalling 3700 tons of refrigeration, one half of which used district steam.

The first NDHA paper calling attention to the value of steam air conditioning as a summer load builder for district heating utilities was presented by J. C. Butler of Chicago in 1935. In it he defined refrigeration terms, described the steam absorption system, the compression systems, and the steam jet system. At this same meeting, Robert D. Martin of the New York Steam Corp. compared the investment and operating costs of air conditioning by steam and by electric equipment.

In 1939 John deB. Shepard of Baltimore said that most of the equipment which he had described had barely emerged from laboratory and field development into standardized form, and little publicity had been given it. Education and publicity were needed. It was reported in the following year that there were several steam jet and steam turbine driven air conditioning installations in New York City.

In 1947 the water supply problem and the necessity of using cooling towers were discussed. Boris Dmitrieff, engineer of the Consolidated Edison Co. of New York, reported that 32 comfort air conditioning installations were connected to the lines of the New York Steam Corp. at that time, varying in size from 6 to 1625 tons of capacity — 21 were steam jet, 10 were steam turbines and one used an absorption system. He urged all manufacturers to get their new postwar equipment on the market.

George H. Tuttle of The Detroit Edison Co. in 1948 said that where the steam utility does not supply high pressure steam, the steam jet machine and the turbine driven units cannot be considered economically, but the absorption type equipment, using nontoxic refrigerants operates equally efficient at low and high pressures.

Robert E. Burke, assistant manager of sales for the New York Steam Corp., showed the effect of the growth of air conditioning on the mains of his organization from practically nothing in 1930 to 47 installations totalling 24,100 tons in 1950. This growth is shown in the chart. Last year, the report gave 90 installations totalling 47,978 tons, about double that of three years before, and as of May 1, 1954, the figure was 97 installations, totalling 53,408 tons. These installations are mostly in office buildings, but some are in stores, banks, theaters, restaurants, clubs, hotels and one is in an apartment.

Under the able leadership of Robert D. Martin of the New York Steam Corp. — now the Consolidated Edison Co. — steam air conditioning has risen during the past quarter of a century to be a very important factor in that utility's heating business. Progress has been made in recent years in other cities, especially in Philadelphia and Detroit, and a great increase in business of this type seems assured in future years.

Steam Distribution Advances

The principal problems involved in the underground distribution of steam for district heating have been and still are economic and technical. Undoubtedly, better steam lines and conduit can be designed, but the cost, of course, would be greater, and the utilities could not justify this. Conversely, if it were possible to build lines as efficient and serviceable as those that are now in use at a lower cost — perhaps by the use of new materials or new methods — prospective customers who cannot now be served because of the extension cost, could then be connected.

The basic problem of distributing steam has not changed during the past 25 years, but some of the methods have been changed. It has always been desirable to use good materials because the distribution lines are usually buried beneath streets and there should not have to be any necessity for early maintenance. They should be so well built that they will be used for a long time, and every effort should be made to build them at the lowest possible cost. A great amount of progress has been made in accomplishing these objectives in the past quarter of a century.

In 1929, engineers were debating about the best kinds of materials to use. Wood log conduit, which had been in use for many years, was decreasing in favor. Channel tile conduit was being used in some cities, and elsewhere multi-cell tile and concrete conduit were being compared as to cost and quality. Even conduit of brick was being advocated, and the first patented metal conduit had been introduced after three years of study and research.

Piping Methods Change

The substitution of welds for flanges on buried steam lines was accomplished only a few years before 1929 and the merits of electric welding as compared to acetylene welding were being hotly debated. Likewise, 85 percent magnesia, laminated asbestos and rock wool for pipe insulation were being compared then.

Some unusual cost saving ideas were being introduced in the early '30's. For instance, in one city, an installation was made in which there were two concentric pipes. The outer one was designed to carry steam at 25 psi or less and the inner one at 175 psi. The condensate from the inner pipe was introduced into the outer one, eliminating some heat losses, but the pipe design was complicated, especially at manholes.

With the thought that if steam could be delivered through a pipe at a greater velocity, smaller and less costly lines might be used. A study of the subject on how high the velocity can be was then conducted to provide this information. Another subject of interest to the distribution engineers at that time was the necessity of expansion joints or other devices to account for the expansion of the conduits.

After two and a half decades, the basic problem is the same: How to build good lines, manholes and conduits for less money? However, times have changed, and the approach to the problem is somewhat different.

Different Conduits Used

Now, a number of types of conduit are available. Some of these make use of such materials as cellular concrete and vermiculite. In these conduits a large percentage of the volume is filled with air bubbles, so they are good insulators. Cellular concrete has even been poured into old conduits to replace deteriorated insulations. One conduit is now made with a mined material which is used in producing a combination conduit and insulator. The material is poured around the bare steam pipe in the open trench. The theory is that heat from the steam turns it into a waterproof conduit as well as an insulator. With this arrangement, the air space around the steam pipe is not present in the new solid pour designs. At least two makes of prefabricated conduit with metal jackets also are available.

The 45th annual meeting of the NDHA was held last month. Among the six papers presented on the subject of distribution, one was devoted to a comparison of the cost of the eight types of conduit construction under a given set of conditions. The conduit types are (1) reinforced concrete conduit with precast concrete roof slab, (2) poured concrete conduit with insulating concrete filler, (3) reinforced concrete conduit with wood forms in place, (4) monolithic concrete conduit, (5) concrete conduit with corrugated steel top and side left in place, (6) conduit with concrete block side walls and poured concrete roof slabs, (7) conduit of insulating aggregates and (8) prefabricated conduit.

The great progress that has been made through these many studies is not readily discernible because while they have been in progress, the costs of labor and material have been rising, and purchasing power of the dollar has decreased.

For instance, while better insulating materials are now available, they cost more, and because fuel is more costly, it is uneconomical to lose so much heat from the lines, so a half inch or an inch more of insulation often is warranted.

The increased cost of construction labor has resulted in companies mechanizing their operations. Pavement breakers, trench diggers, manhole excavators, cranes and tractors are being used. Engineers are asking "why do we do it this way?" A second look is being taken to simplify procedures.

Not the least among the new equipment is the DC calculating table which enables the engineer in a short time to determine the pressure gradients in complicated steam network problems. This is the new approach to an old problem.

Metering the Steam

Condensate meters were the principal means of measuring customers' steam consumption 25 years ago. The 10 largest steam utilities then had in use 6661 condensate meters and 2789 steam meters, and of the latter all but 200 were in one city. In addition to the present revolving drum and bucket type meters, the so called tilt trap, float trap and dump bucket types were available, which have since vanished.

During the period under discussion, standard piping arrangements for the installation of condensate meters and standard procedures for testing their accuracy were devised. Demand attachments for both condensate and steam meters were invented. In 1936, and again in 1946, meetings were held to develop specifications for a better meter.

When properly sized, installed, and maintained, the types of condensate meters that have survived are very accurate within their normal ranges of operation. Care must be taken, however, to make sure that air and sediment as well as excessive water pressure do not interfere with their performance. Where there are leaks in the steam lines or in the condensate lines ahead of condensate meters or where there is open jet or process equipment from which condensate is not returnable, condensate meters are not able to register the total steam consumption. A study of the necessary steps to make it easier to handle condensate meters is under way.

The measurement of steam consumption by steam flowmeters has increased with the years. In 1952, the records show that the 10 largest companies had in use 5727 steam meters and 8981 condensate meters. In the interval, several new steam meters have been made available. The difficulty has been that they do not record the flow as accurately when operating at low percentages of their maximum ratings. Automatic and manual means have been devised to overcome this failure to a considerable extent but at an additional expense. The district heating utilities are still seeking an accurate and inexpensive meter, and the manufacturers are trying to produce it.

Determining Steam Rates

During the early part of the 25 years under discussion, several papers were presented by authorities on the subject of determining rates. These papers covered the various forms and types of rates and how they are determined. With this additional knowledge of the subject, it might be supposed that changes would have been made in the types of rates then in use, but this did not occur.

A comparison of the rates in use then with those that are used now shows little change of form, but other improvements are evident. Most rates in 1929 were of the block meter type, but there were a few demand rates and only one or two flat rates. Most rates included fuel adjustment clauses, penalty or discount clauses and minimum payment clauses.

Present day rates more nearly reflect the actual cost of providing service. Now, more rates have demand features, and penalty clauses as well as flat rates have practically disappeared.

The cost of steam has risen in the interim, keeping pace with the increases of payrolls and material costs. It should be remembered that in many localities, in the earlier days of the industry, exhaust steam was regarded as a worthless byproduct of electric generation. Steam service is now usually operated as a separate business, and the struggle to establish adequate rates for a service, which now must stand on its own merit, has been a long and hard one.

Steam Generation

The district heating industry is in a peculiarly fortunate position with reference to steam generation in that many of the steam utilities are affiliated with large electric utilities. Therefore, they have access to more specialized personnel for the design and operation of their plants than they could afford as independent companies. Of course, the steam business cannot justify all of the refinements in its boiler plants that are justifiable in the electric business, with the higher load factors that are generally experienced.

In the last 25 years, there have been a number of progressive steps in steam generation. More steam utilities are obtaining steam from their electric affiliates when the generating plants of the latter are near the heated area. With higher steam pressures being used in the electric plants, steam is available from the turbine stage bleeding at pressures which are still high enough to supply the district steam requirements.

Twenty-five years ago, the structures housing the boilers were of heavy masonry, supported by heavy structural steel. Since the war, there has been a growing trend of constructing lighter buildings for this purpose. This should decrease the investment in generating plants, which is one of the changes needed if district heating is to advance further. An additional step in this direction is the construction of semi-outdoor boiler plants in which only the instruments and personnel are housed for protection from the weather.

Another plan that has been tried is the replacement of old boilers in generating plants with new and more efficient ones. What can be done is somewhat limited by the space available and by the position of the columns. Recently, at the Willis Av. heating plant of The Detroit Edison Co., a boiler which generates 230,000 lb per hr of steam was erected in a bay originally intended for a 90,000 lb one. This indicates the improvement in boiler design that has occurred over the years.

Much has been done to improve heat distribution and water circulation in order to increase the capacity of existing equipment. Maintenance methods have been devised to greatly increase the life of boilers. Leasing boilers for peak loads and for reserve capacity, a practice developed in the war years, has been helpful in keeping the investment to a minimum.

Steam Utilization

There have been great advances made in steam utilization. Most of the temperature controls in use have been developed during the past 25 years. Building owners and tenants in the depression years were keenly aware of their heating costs, and the steam utilities had a strong incentive to advise their customers on how to save money in heating. Tremendous reductions in steam consumption were made in buildings where the owners were willing to make recommended changes, install temperature controls and otherwise improve their operations.

District heating is now generally accepted as a satisfactory method of heating buildings where it is available. This present situation is far different from that which existed in 1929.

Air Conditioning Aids Good Printing

. . . craftsmen are told

SPOKESMEN FOR both the air conditioning and printing material industries recently advised the Printing Craftsmen's convention in Dallas that air conditioning has proved valuable in solving many of the production problems in fine register, multicolor lithograph printing.

Dr. Paul J. Hartsuch, lithographic consultant with the printing ink division of the Interchemical Corp., defined sufficient air conditioning as "automatically controlling air at 75 to 80 F with relative humidity of 45 to 50 percent." He added that the concept includes the addition of moisture to air during the dry months as well as refrigeration and humidity control during the summer.

Dr. Hartsuch observed that "the variation of moisture in light sensitive coatings is the source of most plate making troubles experienced in hot, humid weather. It can account for plate scumming on the press, as well as for some image areas failing to take ink in deep etch plates. The best answer is air conditioning.

"With controlled temperature and humidity, a plate department can set up standard procedures for whirling, exposures, developing and etching. More uniform, higher quality plates can be produced in less time."

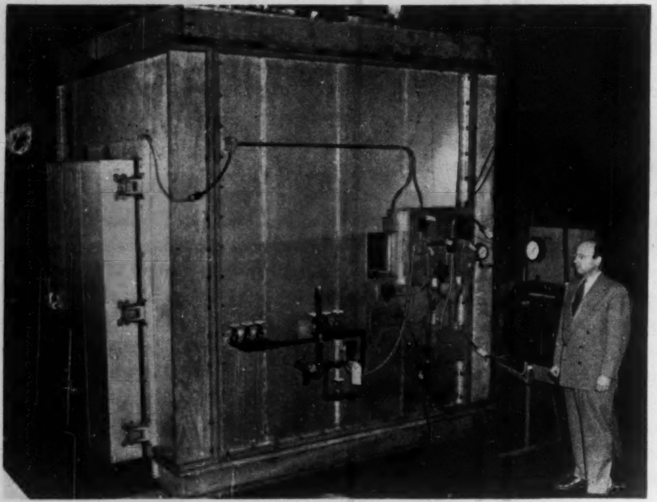
Dr. Hartsuch also said that in the pressroom, air conditioning is important because it permits more predictable ink drying, and eliminates many paper troubles such as wrinkles and change of dimensions on successive multicolor runs. Static electricity also can be reduced by proper humidity control. And the comfort of employees is an important factor in air conditioning.

Representing the air conditioning industry, Ralph A. Gonzales, of Chrysler Airtemp, observed that fine register, multicolor offset lithography has the most exacting requirements in regard to humidity. "The pressroom relative humidity range usually is given as 46 to 48 percent, with the stock storage room 5 to 8 percent above the pressroom," he said. He reported that many printing plants are obtaining excellent production results from the installation of standard human comfort air conditioning systems to handle the summer problems.

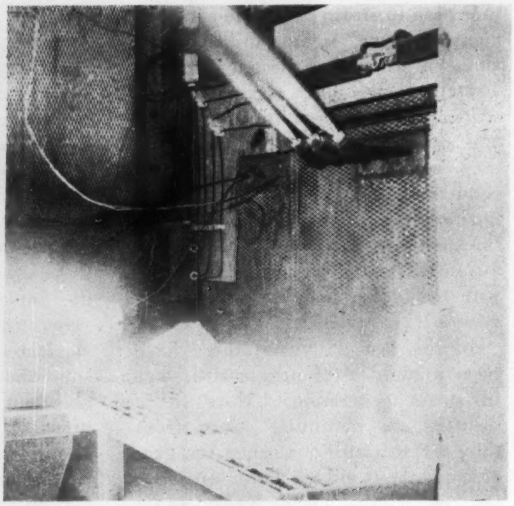
"The humidity control maintained by these systems — while perhaps not entirely within the bounds envisioned by the paper and technical printing man — is a major improvement over previous conditions," he said.

For the purpose of general comparison, Mr. Gonzales estimated that year around air conditioning, with exact temperature and humidity control, will cost approximately $4 per sq ft for the average shop. On the same basis, air conditioning installed primarily for human comfort will average $2 per sq ft of floor space, he said.

"Two authorities influence the work of the air conditioning engineer in the printing plant: the technical expert on paper and printing, and the business operator of the printing establishment," he said.



THE COLD TEST chamber, showing CO_2 piping, electric control panel, door panel construction, observation port — and the author



THE CARBON DIOXIDE NOZZLES in action for refrigerating the low temperature test chamber. Note the grating for dry ice

Direct Carbon Dioxide Injection

cools low temperature test chamber built around 50 ton stroking press

By Robert Greenwald
The Lumm Corp.
Air Conditioning Contractor

A UNIQUE ultra-low temperature test chamber — built by the Lumm Corp. at one of the defense plants in the Toledo area — employs the direct injection of carbon dioxide as a means of temperature reduction. In addition, it was necessary that the chamber be built so as to permit ready disassembly when not in use, to avoid interference with normal production.

The requirements for this project, given by the plant engineer (who, with his plant, must remain nameless because of security regulations) were:

a) Provide controlled test conditions in the test chamber ranging from minus 100 F to plus 165 F.

b) Provide simple automatic temperature controls.

c) Build the chamber around an existing 50 ton stroking press so that pressure could be applied to the test part at either temperature extreme.

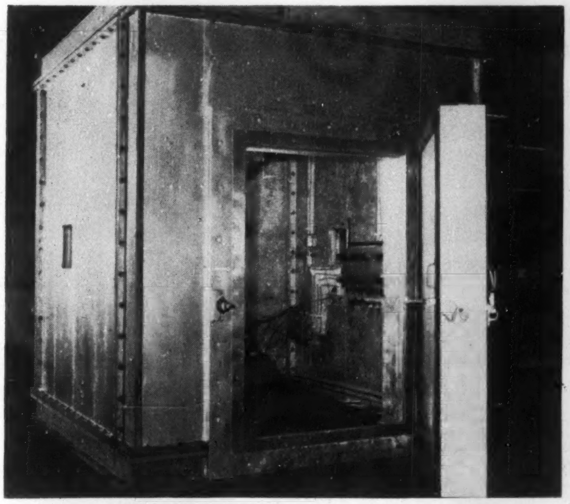
d) Build it so that it could be easily assembled or disassembled.

e) Keep the cost and space requirements at a minimum. This is usually referred to as a "last but not least" item, which can be aptly applied here.

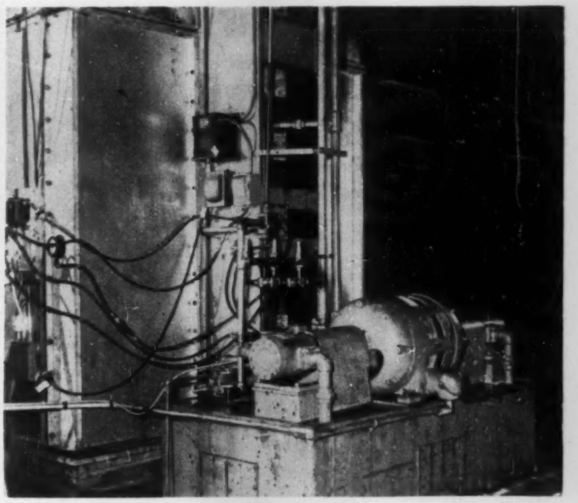
The purpose of the tests in this chamber is to obtain acceptance of the completed part by a branch of the defense department. The tests will be required about once in three months and might even be discontinued after quality control has reached the desired level. Therefore, it was essential that the installation be kept as simple as possible.

Why CO_2 Is Used

It was decided that direct injection of carbon dioxide to provide the refrigeration would best meet the important requirements of simplicity and disassembly. The saturation temperature of carbon dioxide at standard atmospheric pressure is minus 109 F, so it was assumed that a close approach to the lower test temperature would result from its use. Inquiries were made of several major carbonic suppliers but none could provide information on this application for cooling large test chambers. It had been used successfully in the rubber industry to chill tumbling barrels to remove the flashing from molded rubber parts. Our analysis indicated that the probability of success was at least fair and, in any event, the same chamber could be converted to use with other means of refrigeration if the results were not satisfactory. Heating was not considered a problem since this could be easily accomplished with electric strip heaters.



THE STRIP HEATERS, nozzles, wiring, pit and insulation may all be seen in this interior view of the unique test chamber



THE METHOD OF attaching the rear panels, as well as the hydraulic equipment and piping, are illustrated in this rear view

The test chamber was constructed around a stroking press having a capacity of 50 tons and a frequency of about 16 strokes per minute. It was desirable to keep the hydraulic equipment outside because proper operation would otherwise probably be difficult at either temperature extreme. Also, the inclusion of the entire press within the cold room would require the room to be quite large — so it was decided to enclose as little of it as possible. A point about 2 ft from the front of the welded steel press frame was selected as the rear point of the chamber because it was comparatively smooth and free of obstruction to attaching the structure. The internal dimensions would then be 8 ft long by 7 ft wide by about 10 ft high.

The Cold Room Construction

Since ease of assembly was an important factor, it was decided to build the room in panels that could be bolted together. The front and two sides were each made in a single panel; the rear wings were made in two panels, one for each side of the press; and the ceiling and floor were each made in two panels, since they must fit tightly around the press. The concrete pit is lined with 6 in. of insulation which is covered with a soldered metal liner to protect it from grease, moisture and abrasion. The panels have 8 in. of insulation in four layers, each 2 in. thick, with the joints staggered. The exterior is of ¾ in. plywood covered with galvanized metal having soldered seams. The interior is covered with expanded metal sheets to hold the insulation secure and yet offer no resistance to the escape of any entrained moisture in it. The edges of the panels were made 12 in. wide of a double thickness of ¾ in. plywood glued together. Felt gaskets 7/16 in. thick were placed between adjacent panels during erection.

Prior to installing the insulation within the panels, the fabricated wood frame and exterior of each was baked in an oven at 165 F for 8 hr to drive out any entrained moisture. Upon removal from the oven, they were quickly sprayed with a liquid plastic material that was readily absorbed into the pores of the wood. This plastic material is pliable at very low temperatures so it was felt that the possibility of the wood splitting due to the freezing of moisture within it would be greatly reduced. The panels were bolted together on both sides of each face by bolts on 8 in. centers.

Nozzles Inject Carbon Dioxide

The door is a standard 8 in. thick refrigerator door for subzero use with a resistance electric heater around the edge to prevent it from freezing tight in the closed position. An observation port on each side is of two four-ply insulating glass panels in series with a 2 in. wide tray of silica gel crystals between.

Two sets of three nozzles each are used for carbon dioxide injection. They were machined from steel shafting with bore diameters of 0.025, 0.050 and 0.100 in. in each set. Each nozzle is manually controlled from an individual gate valve in the line feeding through the panel and the entire manifold for the six nozzles is automatically controlled through a solenoid valve operated by a remote bulb, positive acting thermostat.

The nozzles can be pointed at any angle required to obtain proper coverage and create turbulence. A 4 in. diameter purge and relief pipe was extended from the ceiling through the roof of the building in which the chamber is located. It has a soft chamois flapper valve that opens under positive pressure from within and helps to prevent the entry of warm, humid air when a positive pressure does not exist.

Heating capacity for the high temperature portion of the test is provided by a 3000 watt bank of electric strip heaters on each side of the room. They are automatically controlled by a remote bulb thermostat operating a relay in the power supply line. Half of each bank of heaters can be switched off so that the frequency of cycling can be reduced at light load.

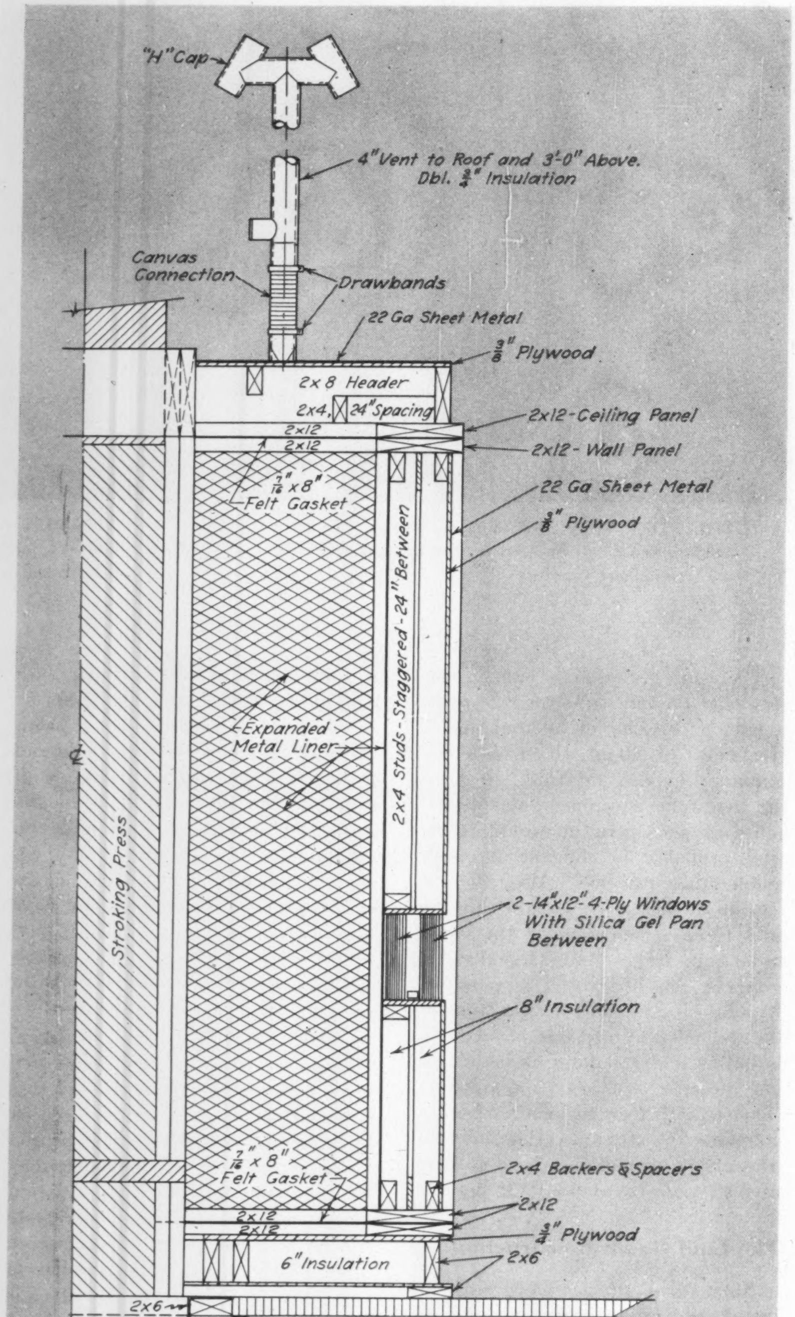
In order to avoid possible freezing of the hydraulic fluid, a low temperature refrigeration oil is used in the hydraulic system of the press. No trouble has been experienced in this respect at the lowest test temperatures reached.

Operation of Test Chamber

Upon completion, the test chamber was put into operation for a preliminary check-up under actual test conditions. The heating equipment was checked first so that moisture entrained within the insulation would be driven out as a byproduct of this part of the test. The internal air temperature rose rapidly when all the strip heaters were turned on and reached 165 F in about 30 minutes. Half of them were then switched off and the remainder maintained the thermostatic setting quite easily, with periodic cycling for about another 5 hr until temperature stabilization was reached. This was determined by an automatic 12 point continuous temperature recording instrument using thermocouples for sensitive elements. At the end of this portion of the test, the door was opened and the internal air temperature dropped to the ambient in about an hour.

During the cold test, carbon dioxide was supplied by a set of three 50 lb cylinders attached to the pipe manifold. As each set of cylinders was emptied, it was replaced by another full set during the test run. This was found to be tedious and time-consuming, so it was decided in the future to use a tank truck with a direct connection to the chamber for supplying the carbon dioxide. This also reduced the need for constant personnel attendance during the pulldown period and improved the operation of the automatic temperature control.

After being in operation for only a short period of time, the nozzles became plugged with accumulated carbon dioxide frost that reduced the discharge sharply. The 0.100 in. nozzles cleared themselves periodically when the frost plug was blown


"H" Cap
4" Vent to Roof and 3'-0" Above. Dbl. 3/4" Insulation
Canvas Connection
Drawbands
22 Ga Sheet Metal
3/8" Plywood
2x8 Header
2x4, 24" Spacing
2x12
2x12
2x12-Ceiling Panel
2x12- Wall Panel
22 Ga Sheet Metal
3/8" Plywood
7/16" x 8" Felt Gasket
2x4 Studs-Staggered-24" Between
Expanded Metal Liner
℄
Stroking Press
2-14"x12"-4-Ply Windows With Silica Gel Pan Between
8" Insulation
7/16" x 8" Felt Gasket
2x4 Backers & Spacers
2x12
2x12
2x12
3/4" Plywood
6" Insulation
2x6
2x6
12 Ga Sheet Metal
1x6-12 3/4" O.C.
2x4 Spacer
6" Insulation

MANY OF THE construction details of the test chamber are clearly illustrated in this sectional sketch off after partially blocking the bore. The smaller orifice nozzles could only be cleared by opening and closing the hand valves several times. These were later bored out to 0.100 in. diameter also, which made all six the same size. All were used during the early period of the pulldown, then three were shut off and only one was needed to maintain the thermostatic setting after stabilization was reached.

The air temperature was reduced rapidly after the carbon dioxide began to feed into the chamber, but over 18 hr elapsed before all of the interior thermocouples showed consistently the same reading at about minus 95 F. Readings of minus 105 F were obtained at two thermocouple locations. The rather great bulk of the stroking press and of the test part were responsible for the lag in reaching stabilization of temperature for both the hot and cold parts of the tests. It was equivalent to a soaking process. Some reduction in pulldown time would have resulted from indiscriminate dumping of carbon dioxide in the test room but this was not considered either necessary or desirable. The flow rate was kept below the point where fogging would occur and obstruct observation through the ports.

A subsequent preliminary test run was made, at the start of which the room was packed with about 2000 lb of dry ice and left for 24 hr without further addition of carbon dioxide. By that time, the temperature had stabilized at about minus 30 F. The nozzles were then opened and a stabilized temperature of minus 70 F was reached in 8 hr. It was decided to use this method for all future tests.

Slight Changes Needed

The preliminary tests showed the need for some slight changes — none of which was of great consequence — and these were promptly made. By the time the official test was to be made, it was evident that the test chamber could produce the desired conditions. The extreme conditions for the test were then established at 165 F for the high point and minus 70 F for the low point.

The high temperature part of the official test was accomplished first. Stabilization at 165 F was obtained in 6 hr, at which point the test piece was subjected to pressure from the stroking press. No difficulty was experienced, so — in a relatively short time thereafter — this part was completed and the door opened to permit cooling.

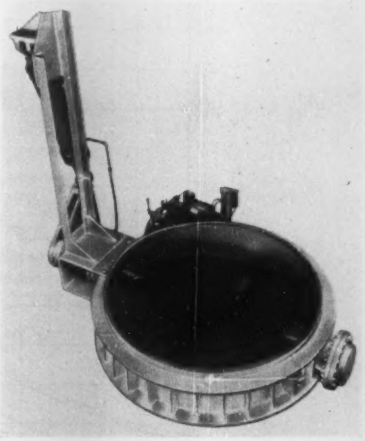
Several hours later the chamber was packed with 1350 lb of dry ice in preparation for the low temperature test. By the following morning — 14 hr later — the temperature had leveled off at minus 30 F, the dry ice being almost completely gone by that time. All of the nozzles were opened for an hour, then three were shut off, and finally (after two more hours) only one was left on until stabilization was obtained at minus 70 F — 5 hr after the initial opening of the carbon dioxide supply line. This temperature was automatically controlled with one nozzle for 24 hr more. During the test, 5250 lb of carbon dioxide was consumed in addition to the dry ice. For this portion of the test, performance was also quite satisfactory. No further tests have been conducted.

Scheme Proved Feasible

The results of the work done with this cold test chamber show that direct injection of carbon dioxide to produce cooling on a fairly large scale is both feasible and practical. The first cost of the installation was much less than it would have been with mechanical refrigeration, but this advantage would disappear if the tests were to be made frequently. In this case they will probably be made no more often than once every three months, so the expense involved will not be excessive. It is also quite possible that a change in defense spending in general, or loss of a contract in this particular plant might occur which would entirely eliminate the necessity for the further use of the test room. The plant personnel have expressed confidence in being able to move and revamp it at another installation where it could be quickly set up to perform similar tests.

It is regretted that acknowledgement cannot be made to the various individuals in this plant who were so helpful and cooperative in the construction of this project. Without their assistance, our task would have been more difficult.

8 Ft Butterfly Valve Controls Air Flow

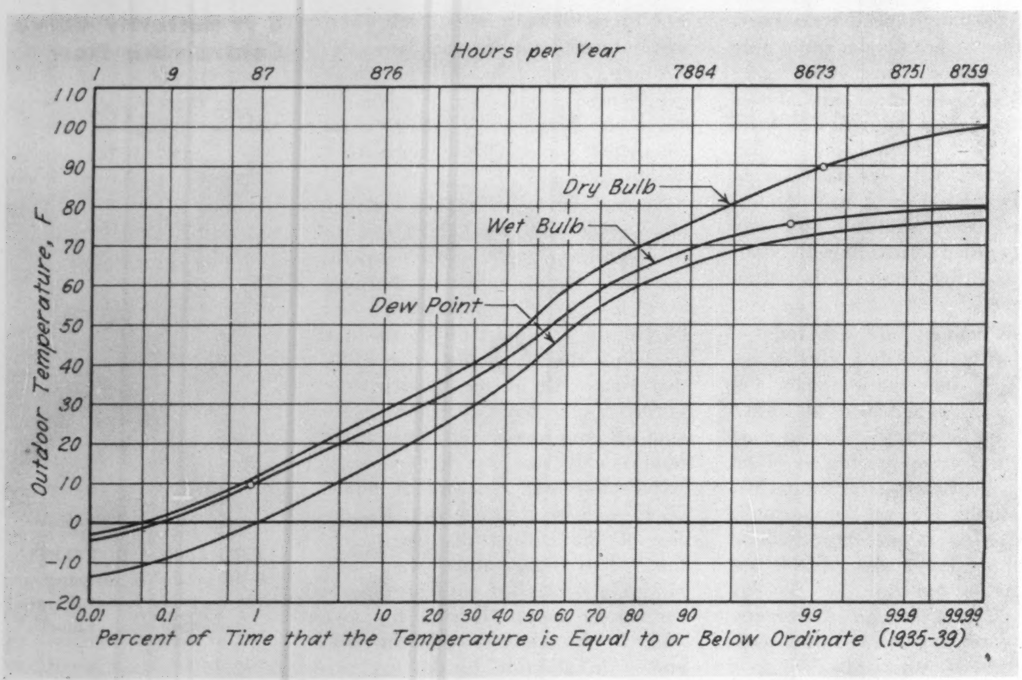


THIS LARGE BUTTERFLY valve is 8 ft in inside diameter and weighs 7.5 tons. It is being installed in a government wind tunnel

ONE OF THE largest butterfly valves ever built for handling air is being installed in a wind tunnel at one of the government aeronautical laboratories. It is to be used to control the volume, speed and pressure of the wind to which planes are subjected in test, according to the W. S. Rockwell Co. It is 96 in. inside diameter with the overall diameter of the flange 108 in. The assembled valve, weighing 7.5 tons, required special transportation arrangements.

Because of its size and special manufacturing conditions, the valve was fabricated of steel, structural members and forgings. One of its unique features is the construction of the shaft bearings. The entire unit was designed to be operated with the blade shaft in any position, so that it was necessary to incorporate a heavy duty, double acting bearing in the assembly.

The blade is actuated by a large hydraulic cylinder of 10 in. bore and 51 in. stroke, with oil at 1000 psi, as the power medium. A power unit of this size is capable of developing a theoretical torque of 3,300,000 in.-lb. This valve has its own hydraulic system complete with motor, pump, accumulator and controls, and it was designed to handle air at temperatures up to 390 F and at pressures to 15.3 psi. The maximum pressure differential across the blade when closed is 9.7 psi.



1 FREQUENCIES OF OCCURRENCE of dry bulb, wet bulb and dew point temperatures at Newark

Summer Design Temperatures

By A. Donald Hay

Air conditioning and heating engineers depend greatly upon the weather. The author continues his discussion of the weather this month by considering summer design temperatures. Later, he will give information on establishing proper design conditions away from weather stations and will further compare design conditions.

OUTDOOR DESIGN CONDITIONS for summer air conditioning depend greatly upon both dry and wet bulb temperatures. In general, the air must be both cooled and dehumidified. Since it is normally uneconomical to design the air conditioning equipment to take care of the most extreme outdoor air conditions on record some other approach must be used.

Climatic Conditions

Summer climatic conditions found in the U. S. are given in Table 1. The second temperature column is recommended by the ASHVE Technical Advisory Committee on Cooling Load. These temperatures represent the maximum hourly outdoor temperature which has been equalled or exceeded. 2½ percent of the total hours of June, July, August and September at each station. The hourly value corresponding to this analysis is 73 hr.

The third column of temperatures represents the average annual maximum temperature and may be compared with the previous column of average annual minimum temperature. These values are slightly higher than those in the other recommended columns and have not been accepted as design dry bulb temperatures for cooling load calculations for a building although they are sometimes used in determining the size of air cooled condensing units.

The last two columns in Table 1 show the design temperatures which

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Mr. Hay has had experience in the advanced engineering section of the air conditioning division of a prominent manufacturer, in the air conditioning design section of a well-known firm of consulting engineers, as a teacher of air conditioning in the school of engineering at Princeton University, and as a senior staff engineer at the Franklin Institute Laboratories for Research and Development.

have been generally adopted in large cities and by experience have been found to be satisfactory. The dry bulb temperatures have been rounded off to the nearest 5 F.

When the design dry bulb temperature for a city is given as 90 F, and the design wet bulb temperature is 70 F, this is usually referred to as a design condition of 90-70. Note in Table 1 the large percentage of cities which have design conditions of 95-75.

Weather Conditions Analyzed

Air conditioning installations have been made in the United States where an increase of only 1 F in the wet bulb design temperature would cost an additional million dollars for the air conditioning equipment. Under these conditions it is well worthwhile to analyze the weather conditions normally experienced at the sight of the installation in the design of any system.

The yearly frequency of occurrence of the dry and wet bulb temperatures at the building site should be known in order to calculate the risk of insufficient equipment capacity at the selected design temperature and also to calculate the yearly amount of energy required to operate the equipment. On the probability coordinates of Fig. 1 is shown the frequency of occurrence of temperatures equal to or below stated temperatures as determined from Weather Bureau data of five consecutive years. The following sample problem No. 1 illustrates the use of Fig. 1:

For the city of Newark find:

a) the number of hours per year that the dry bulb temperature is likely to be 2 F or below.

b) the percent of the hours of the year that the dry bulb temperature is freezing or below.

c) the number of hours per year that the wet bulb temperature is above 75 F.

Solution:

a) Read from upper coordinate 9 hr per year.

b) Read from lower coordinate 15 percent of time.

c) Read from lower coordinate 98.4 percent, then,

(100 — 98.4) (8760) = 146 hr per year.

The advantages of using these coordinates are that the values of most interest (at the extremes) may be determined accurately, and that the curves approach straight lines (statistically this indicates normal dis-

TABLE 1—SUMMER CLIMATIC CONDITIONS in the U.S.

State	City	Highest temp. ever recorded[a] F	Design dry-bulb temp. on 2.5% basis[b] F	Av. summer wind velocity,[c] mph	Av. annual max. temp.[d] F	Design bulb temp. in common use, F Dry	Wet
Ala.	Birmingham	103	94	5.4	99	95	78
	Mobile	104	92	8.0	97	95	80
Ariz.	Phoenix	117	107	6.0	113	105	76
	Tucson	112	105		98	105*	72*
	Winslow	103	95			100	70
Ark.	Little Rock	107	97	6.2	100	95	78
Cal.	Fresno	111	103	7.9	111	105	70
	Oakland	102	80		89	85*	65*
	San Diego	106	79		80	85	68
Col.	Denver	104	93	6.9	98	95	64
	Pueblo	104	95		100	95	65
Conn.	Hartford	98	88		94	93	75
	New Haven	94	84	7.4	95	95	75
D. of C.	Washington	106	92	5.9	98	95	78
Fla.	Jacksonville	105	94	8.4	96	95	78
	Miami	100	89	8.7	90	91	79
Ga.	Atlanta	102	93	7.9*	95	95*	76*
	Savannah	105	93	8.0	99	95	78
Idaho	Boise	109	95	5.8	105	95	65
	Pocatello	103	92		100	95	65
Ill.	Chicago	107	92	9.5	98	95	75
	Springfield	109	96		102	98	77
Ind.	Indianapolis	107	91	8.9	99	95	76
Iowa	Des Moines	111	95	8.6*	102	95	78
Kansas	Wichita	109	103	11.8	104	100	75
Ky.	Louisville	103	93	7.2	99	95	78
La.	New Orleans	100	93	6.9	98	95	80
Md.	Baltimore	105	91	7.4	99	95	78
Mass.	Boston	101	87	12.5	94	92	75
Mich.	Detroit	105	89	9.5	99	95	75
Minn.	St. Paul	104	91			95	75
Mo.	Kansas City	112	101	9.1*	103	100*	76*
	St. Louis	111	97	9.5	103	95	78
Mont.	Butte	100	85°		96		
	Miles City	100	97				
Neb.	North Platte	109	98	8.1	103	95	78
	Omaha	114	98		104	95	78
Nev.	Reno	105	93	7.2	101	95	65
N. J.	Camden	105	91		97		
	Newark	104	89		95	95*	75*
N. Y.	Albany	99	88	7.5	96	93	75
	Buffalo	95	86	12.1*	89	93*	73*
N. C.	Raleigh	102	93	6.3	98	95	78
N. D.	Bismarck	109	96	9.5	103	95	73
Ohio	Cincinnati	108	94	5.6	100	95	78
	Cleveland	107	90	11.1	95	95	75
Okla.	Oklahoma City	109	99	9.8	104	101	77
Ore.	Baker	103	90			90	66
	Medford	115	95			95	70
	Portland	105	87	6.5	95	90	68
Pa.	Harrisburg	103	91		97	95	
	Pittsburgh	102	88	8.9	96	95	75
S. C.	Charleston	103	91	9.8	98	95	78
Tenn.	Memphis	105	96	7.3	99	95	78
	Nashville	104			98	95	78
Texas	Amarillo	106	96	11.8		100	72
	Dallas	109	99	9.3	102	100	78
	El Paso	104	97	8.4	102	100	69
	Houston	105	93	8.8	99	95	78
Utah	Salt Lake City	106	95	9.8	101	95	65
Va.	Richmond	104	92	6.4	98	95	78
Wash.	Seattle	99	81	7.7	86	85	65
	Spokane	104	92	6.5	102	93	65
Wisc.	LaCrosse	96	91	6.4	99	95	75
	Madison	106	89	7.9	96	95	75
Wyo.	Cheyenne	100	89	9.2	94	95	65

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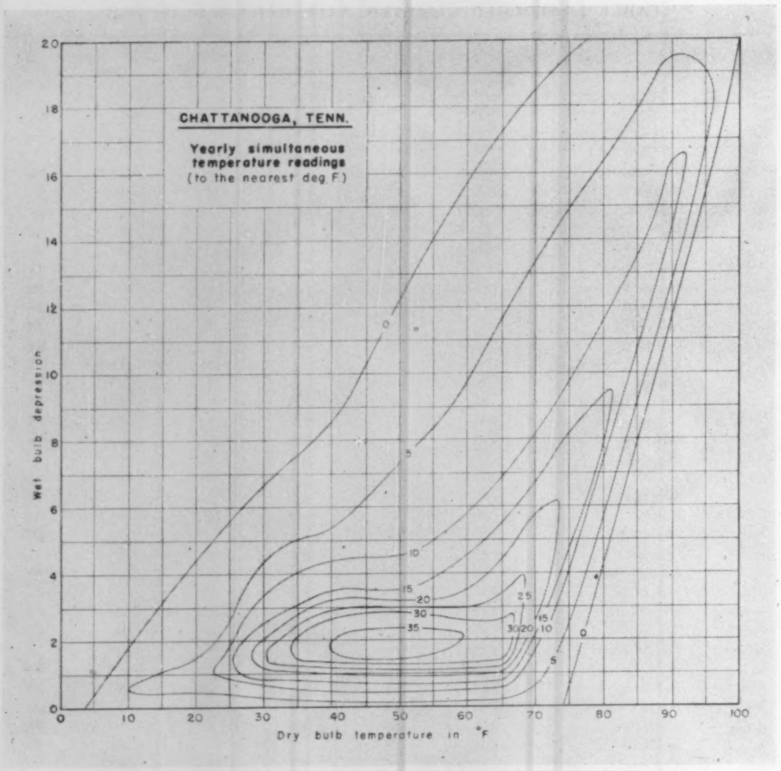
[a] Dry bulb temperature at airport. Period of record is shown in the ASHVE Guide 1949.

[b] The temperature shown is the maximum hourly outdoor temperature which has been equaled or exceeded 2.5 percent of the total hours of June, July, August and September for the period 1935-1939 inclusive. It is recommended by the Technical Advisory Committee of the ASHVE and is based on weather at the airport.

[c] Measured at city office station from June through September.

[d] Average of the highest temperature of the hottest day of five consecutive years from the ASRE Data Book, Basic Volume, 1949.

* Reported at airport. City office station data missing. Data selected from the ASHVE Guide, 1949, except as noted.



2 YEARLY FREQUENCY of simultaneous dry and wet bulb temperature in hours for Chattanooga

tribution). By plotting similar data for other cities in the U. S., the shapes of the curves are similar to those of Fig. 1 except that the curves may be moved vertically or rotated slightly. For cities having a snow cover for 80 or more days per year[21]* a minor hump in the curves occurs around 32 F. However, the extremes are unaffected by this hump.

The approximate dry bulb line may be located easily on probability paper for any city for which the design temperatures are known. The following sample problem No. 2 illustrates this point:

Locate on Fig. 1 the winter and summer dry bulb design temperatures, and the wet bulb design temperature from Table 1.
Solution:

2½ percent of 4 months† is 0.835 percent of a year, so plot 10 F opposite 0.835 percent and 95 F opposite (100 — 0.835) or 99.16 percent. 5 percent of 4 months‡ is 1.67 percent of a year, so plot 75 F opposite (100 — 1.67) or 98.4 percent. (These values of necessity fall approximately on the curves.) A straight line through the two design temperatures approximates the actual curve, or a curve geometrically similar to the dry bulb temperature curve of Fig. 1 will give a better approximation. For exact work, an analysis must be made from Weather Bureau data or from references 29 and 30.

Daily Temperature Variations

The number of hours per year that various temperatures exist in a given location has now been established. However, the daily duration of these temperatures and the simultaneous daily combinations of dry and wet bulb temperatures which cause the summer load, has not been determined. By comparing Fig. 1, which is for a given city, with similar data for other cities[30]*, the number of simultaneous hours above a given combination of outdoor design conditions may be estimated. From this it can be concluded that the daily temperature fluctuations are definitely a function of topography. The amplitude of the temperature fluctuation for a given city in the summer is about constant regardless of the mean temperature. A better analysis may be made from the original Weather Bureau data, although it is very time consuming. The yearly frequency in hours of the simultaneous occurrence of a given dry and wet bulb temperature, is shown in Fig. 2 for Chattanooga, which is situated in a valley.

The following sample problem No. 3 illustrates the use of Fig. 2:

How many hours per year, in Chattanooga, will the dry bulb temperature be 85 F ± ½ F and the wet bulb temperature simultaneously be 76 F ± ½ F?
Solution:

The wet bulb depression is 85 — 76 or 9 F. At the intersection of 9 F and 85 F, read 5 hours.

The selection of the outdoor design conditions at or very near a Weather Bureau station will depend upon: a) An intimate knowledge of the probable weather, including wind velocity, based upon a survey of weather data or a reliable statistical summary of past data covering a period of at least five consecutive years. b) A knowledge of the thermal storage characteristics of the outer walls of the building, and the time consumed in the passage of heat through the walls, and c) A chosen number of hours per year that incomplete air conditioning would be tolerated in the interest of economy.

Effect of Wind

The magnitude and direction of the wind change somewhat at different seasons. Wind data for the summer season is shown in Fig. 3. The effect of the wind may be taken into account in the heat transfer calculations in either of two ways (for normal calculations this effect is not considered): a) For higher than normal (15 mph) wind velocities, an outdoor design temperature nearer the extreme temperature conditions is selected. However, there are no accepted rules for the magnitude of this shift in design temperature.[32]* b) The heat transfer coefficient for the walls may be calculated by taking into account the correct value for the outside air film coefficient for the existing wind condition rather than using the heat transfer coefficient based on a 15 mph wind.

TABLE 2—TIME REQUIRED for heat to penetrate walls, hr

Type of Construction	Wall Thickness, in.						
	1	2	4	6	8	12	16
Stone					5.5	8.0	10.5
Concrete		1.1	2.5	3.8	5.1	7.8	10.0
Brick			2.3		5.5	8.5	12.0
Wood	0.5	1.3					
Insulation	0.3	0.7					

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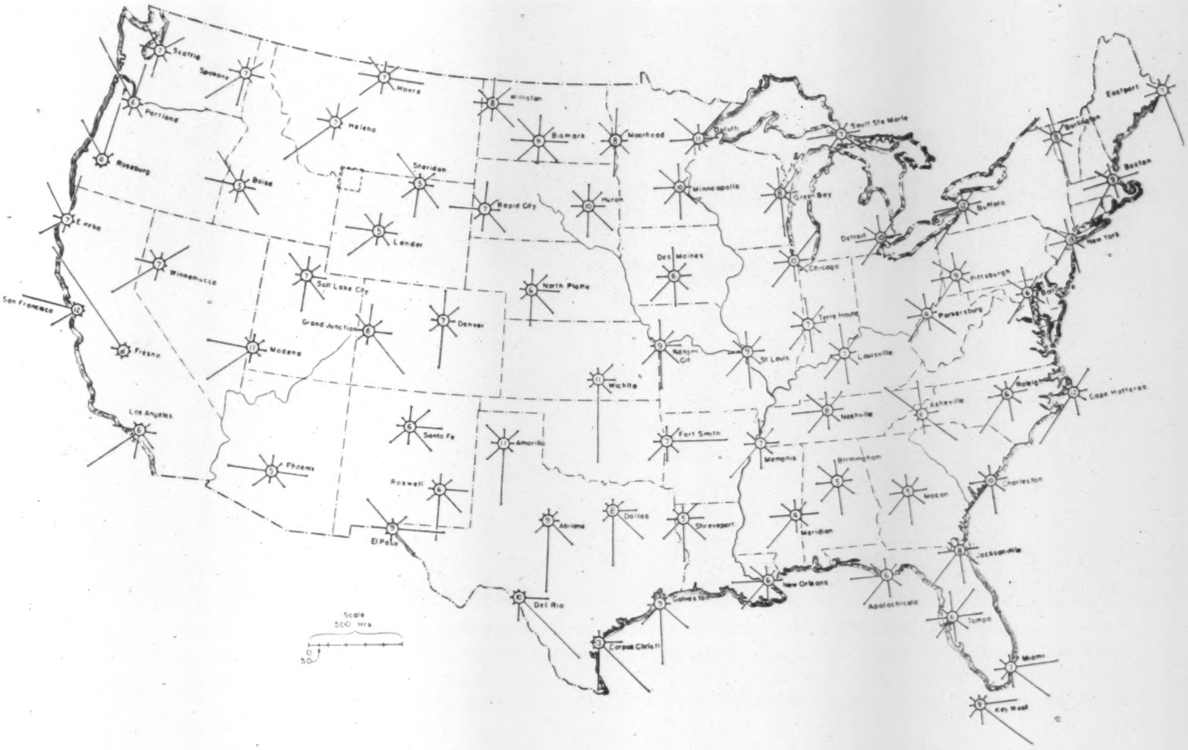
*Superscripts denote references to appear in last article of this series by Mr. Hay.

†The month of March should have appeared in footnote C of Table 1 in the article Heating Design Temperatures that was in the May 1953 HPAC, page 105.

‡Wet bulb temperatures given in Fig. 1, page 78, of the May 1953 HPAC will not be exceeded more than 5 percent of the total hours during June through September and is preferred to Table 1, referred to in above reference.


Seattle
Spokane
Havre
Williston
Portland
Helena
Bismarck
Moorhead
Duluth
Sault Ste Marie
Eastport
Burlington
Roseburg
Boise
Sheridan
Rapid City
Huron
Minneapolis
Green Bay
Boston
Buffalo
Eureka
Lander
Des Moines
Detroit
Chicago
New York
Pittsburgh
Winnemucca
Salt Lake City
North Platte
Terre Haute
Parkersburg
San Francisco
Grand Junction
Denver
Kansas City
St Louis
Louisville
Fresno
Modena
Wichita
Raleigh
Cape Hatteras
Asheville
Nashville
Los Angeles
Santa Fe
Amarillo
Fort Smith
Memphis
Birmingham
Phoenix
Roswell
Charleston
Macon
El Paso
Abilene
Dallas
Shreveport
Meridian
Jacksonville
New Orleans
Apalachicola
Galveston
Del Rio
Tampa
Corpus Christi
Miami
Key West
Scale
500 Hrs
0
50

3 SUMMER WIND data for 71 stations in the U. S. The length of each line indicates the number of hours in a normal July that the wind blows toward the center circles. Values in the circles are average July velocities in mph (from the Engineering Manual for Industrial Cooling Towers, published by the Marley Co.)

Cooling Load Spread

The time consumed for the passage of heat through several types of wall construction is shown in Table 2. For composite walls, made of two materials, the time for penetration of heat is approximately the sum of the hr for each material plus 0.5 hr, while for three or more materials the sum of the hr plus 1.0 hr gives a good estimate for the total time consumed. It should be noted that the transmitted heat load for 16 in. of brick wall is exactly out of phase with the ventilation heat load in the diurnal temperature cycle, which results in a spreading out of the load on the air conditioning equipment.

[Mr. Hay's article in the March '53 HPAC discussed measuring weather, and in April '53 he wrote on the energy from space and where it goes. Heating design temperatures was the subject for the May article. The next article by him will be devoted to climatology of the U. S. and micrometeorology and analysis of weather conditions so as to achieve air conditioning economy.]

Aircraft Air Conditioning Developments Sought

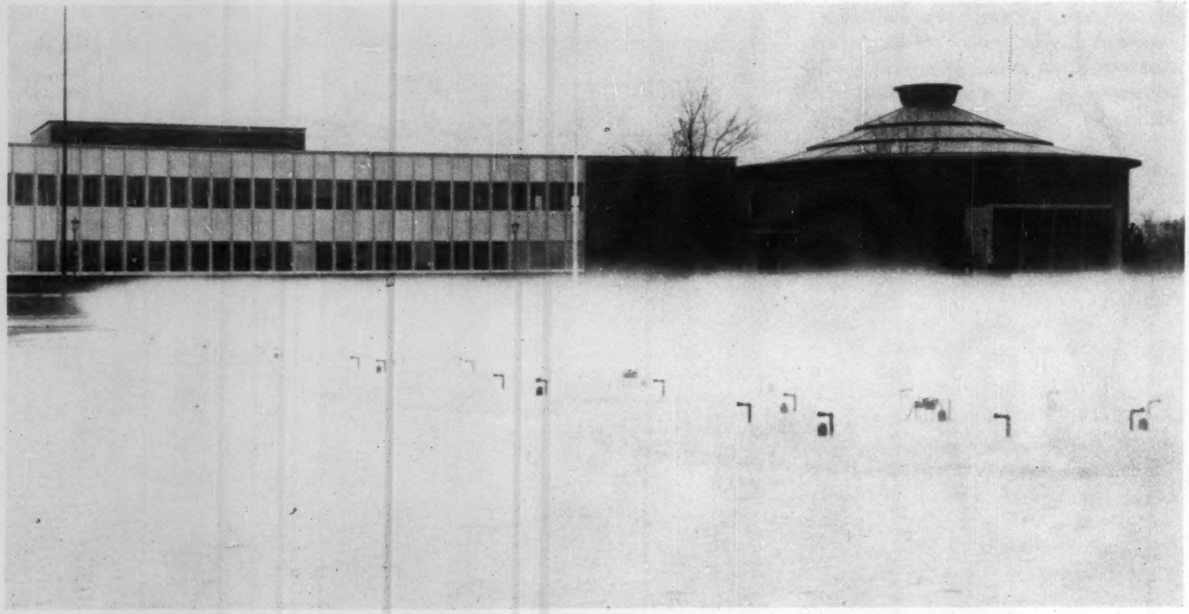
. . . needs listed

AIRCRAFT AIR conditioning systems fully satisfactory "from all aspects of good design" need to be developed, it was declared in a presentation by United Air Lines engineers at the national aeronautics meeting of the Society of Automotive Engineers, held in New York.

The presentation, made by Charles Perry, A. F. Bullard and O. E. E. Anderson of United's engineering department at San Francisco, was titled *Airline Requirements of Air Conditioning a Jet Transport.* They defined an air conditioning system of good design as "one that excludes the need for extensive modification to attain basic performance or the need for excessive maintenance."

As examples of deficiencies which have resulted in operational problems and modification of present aircraft systems, they listed:

Cabin pressure surges due to inconsistencies of control responses; cabin temperature control range too broad; cockpit air distribution system inadequate; cabin air inlet design which permits heavy condensation on air inlet hardware; cabin air distribution system causing excessive temperature differentials between control cabin and cabin extremities; system response rates too high; points of maximum heat generation, such as buffet areas, run too hot and have poor odor control; ventilation rates too dependent on having all pressurizing machinery operative; and cockpit temperature control system too strongly affected by cabin air conditioning.



COOLING PONDS form a prominent feature of the landscaped area around the new styling building of the Ford Motor Co. research and engineering center

New Ford Styling Building

By Joseph Spitzley, President
R. L. Spitzley Heating Co.

. . . has many interesting heating, piping and air conditioning features

• **The heating, piping and air conditioning systems in the new styling building at the Ford Motor Co. research and engineering center have many interesting features. Water consumption for air conditioning is held to a minimum through the use of cooling ponds to cool the condensing water. Split systems are used for heating the three wings of the styling building with steam supplied to convectors. Many piping systems are installed for compressed air, water and snow melting.**

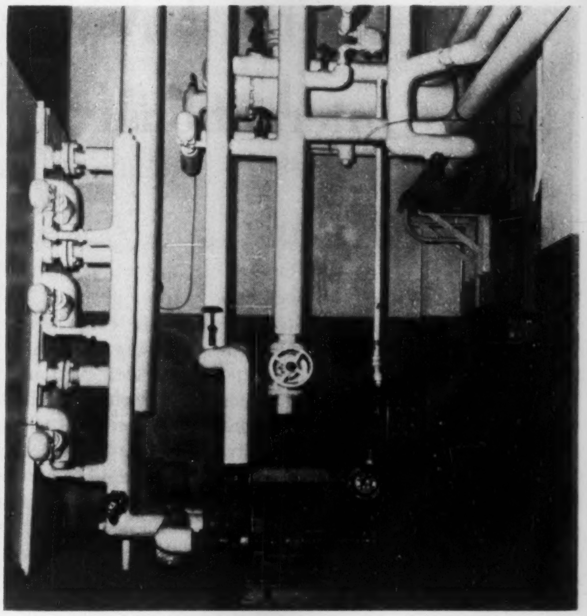
THE IMPORTANCE of air conditioning in the modern business world is readily apparent as the new $80 million research and engineering center for the Ford Motor Co. takes shape in Dearborn, Michigan. The most recently completed facility at the center is the $11.5 million Ford engineering staff styling building. Its 295,000 sq ft of floor area is devoted to designing cars and trucks.

Cooling Ponds Used

Cooling ponds, with eight million gallons of water for cooling the condensing water for the air conditioning systems in the buildings, form a prominent feature of the landscaped area around the center. A cooling pond directly in front of the styling building provides water for the two 440 ton centrifugal compressors. The condenser water for the refrigeration compressors flows by gravity from the cooling pond through a twin strainer to the sump suction header. The water is circulated through the condenser heat exchanger and back to the ponds by three 50 hp 1320 gpm pumps capable of operating against a total head of 100 ft. As the water leaves the building, it is treated by a chemical feeding system to retard the growth of algae in the ponds.

Condenser water return piping at the ponds is arranged so that the water may be returned either through an underwater influent or through a spray header. The spray pattern has been carefully planned so as to

THE AIR CONDITIONING equipment and fans for the studio wing of the new styling building are installed in the loft above the first floor corridor. Chilled water is circulated to the various cooling coils for each area to be served



SUPPLY AND RETURN piping for the snow melting system that is installed in the concrete loading dock and ramp to the basement is underground, but the circulating pump and controls are in the basement fan room

produce an attractive effect, especially at night when it is illuminated by colored underwater lights as well as floodlights from the building. The cooling ponds have a normal operating level just below the spray heads and a wintertime reflecting level which allows the ponds to freeze over without disturbing the spray piping.

The air conditioning is accomplished by means of circulating chilled water to the cooling coils at their respective locations by three 40 hp, 1050 gpm pumps capable of operating against a total head of 110 ft.

Steam Piping in Tunnels

Heat for the building is provided by steam from the nearby power house. The steam pipes are installed in a system of tunnels connecting each building in the project.

One side of each of the tunnels is walled off for pipe space, and the remaining tunnel area has been finished off with terrazzo floors and fluorescent lighting for pedestrian use. In addition to entrances provided in each building, the tunnel system has two outside entrances. Each section of tunnel has an equipment room which contains sump pumps, a steam pressure reducing station, condensate pumps and an exhaust fan.

Expansion in the steam and condensate piping in the tunnel is taken up by 42 expansion joints ranging in size from 1 in. to 12 in.

Steam under 125 lb pressure enters the styling building from the steam tunnel and, after being metered, is reduced to 40 lb by a primary pressure reducing station. The 40 lb steam then goes to the main fan room where the secondary pressure reducing station reduces it to 5 lb. It is then distributed throughout the building.

Heat By Split Systems

The styling building is divided into three wings — the studio wing, the design wing and the rotunda. The heating is accomplished by a split system with convectors carrying the transmission load and the air conditioning system carrying the balance of the load. In the studio wing, the convectors in each bay are provided with an automatic valve operated by its own thermostat.

The building is built of reinforced concrete with brick, limestone and aluminum exterior. It is finished with a sheet metal wall lining and partitions which include fronts for the convectors. The heating elements were furnished by the heating contractor, and he adapted the installation to the conditions determined by the metal wall lining contractor.

The air conditioning equipment and fans for the studio wing are installed in the loft above the first floor corridor. Each studio and each bay of the drafting room is served by its own air conditioning unit and exhaust fan.

Vacuum Heating System

The design wing and rotunda are served by a vacuum heating system using vacuum pumps and a control which features an outdoor thermostat, a room thermostat and a temperature sensing element on the last convector in each zone. These three points, operating through a master panel, regulate the pressure differential across the steam valve.

The roof monitor above the fan loft is a combination outdoor air intake, an exhaust plenum and a mixing chamber which is equipped with

United Association Sponsors International Apprentice Contests

. . . finals scheduled for August 10-12

INTERNATIONAL apprentice contests being conducted by the United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the United States and Canada will culminate August 10, 11 and 12 at Purdue University, Lafayette, Ind., when the winners of the state (or provincial) contests compete for the final awards. Winners of local contests progress to the state or provincial contests, and winners of the latter compete in the finals at Purdue.

Martin P. Durkin, general president of the UA, points out that apprentice training is one of the very important parts of the industry. Aim of the contests is to stimulate better training in order to gain more competent mechanics.

There are two contests, one for fifth-year pipefitter apprentices and the other for fifth-year plumber apprentices, with different training material for each, of course. The pipefitter program, sponsored by the UA, is in cooperation with the Heating, Piping and Air Conditioning Contractors National Association.

Certainly, the winning pipefitter apprentices (there will be three awards in each group) will have demonstrated a thorough training and excellent knowledge, as the suggested outline of the type of the material that may be used in the state or provincial and the international contests is most complete. Written tests constitute 75 percent of the total grade in these contests, with a performance test representing the other 25 percent.

The outline for the pipefitter contest comprises over four printed pages listing a wide variety of subjects. Its principal divisions are heating and heating cycles (steam heating, both gravity and mechanical return; hot water heating, both gravity and forced; and steam and hot water heating boilers); elementary physics; oil burning; steam power (including piping); the refrigeration cycle; air conditioning (including central, packaged and room unit equipment); industrial and process piping; welding processes and fabrication in accordance with applicable codes; diesel engines; gasoline stations and systems; instruments and controls; safety methods; care of tools and equipment; and public and labor relations.

The performance test outline covers oxyacetylene cutting, oxyacetylene and electric arc welding; sweating of copper tube joints; bending pipe and tubing; assembly of accessories (valves, traps, controls, etc.); and knot tying, rigging and signalling.

We don't know, of course, at the present time the names of the winners of the international contest —but we want to extend our congratulations anyhow. They will certainly deserve them!

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proportioning dampers to control the ratio of outdoor to recirculated air delivered to the supply unit. These dampers have a range of 100 percent outdoor air and 100 percent exhaust to 25 percent outdoor air and 75 percent recirculated air.

Special Ventilation Necessary

An unusual ventilating problem was caused by the overhead lighting in the studios. The lights, designed to totally eliminate shadows on the car models below, generate intense heat. Special exhaust ducts and a 1560 cfm exhaust fan are used to exhaust air through the light fixtures in each studio.

The rotunda showroom, one of the unusual features of the building, is 120 ft in diameter with an arched ceiling 42 ft high at the center. The rotunda exhaust fans — 16,600 cfm combined — are mounted above the ceiling and discharge into an exhaust plenum.

Many Piping Systems

A 40 hp, 200 cfm air compressor furnishes 100 lb air for use throughout the building. Pressure reducing valves are installed on the temperature control air line as well as other locations. The studios are served by floor boxes — six in each studio — which contain two "quick connect" compressed air outlets.

The copper water piping has dielectric insulators at the connections with piping of other metals and at all pipe supports and hangers to prevent electrolysis and eventual failure of both metals.

Because of elaborate landscaping around the building, certain areas have been provided with a complete lawn irrigation system, including a surge tank, a 30 hp booster pump, a hydro-pneumatic tank and a complete system of automatic controls.

Another feature of the new building is a snow melting system installed in the concrete loading dock and ramp to the basement. Supply and return piping is installed underground in a split tile conduit with the hot water convertor, the circulating pump and the controls in the basement fan room. An open expansion tank is installed in the fan loft above the first floor corridor.

The structure was designed by Voorhees, Walker, Foley & Smith of New York. The heating, air conditioning and piping contract was executed by the R. L. Spitzley Heating Co., Detroit.

Code Requirements for Refrigerant Pipe and Tubing Outlined

. . . B31.1 and B9 regulations

SECTIONAL committee ASA B31 on the Code for Pressure Piping has established an orderly procedure to consider requests for interpretations and revisions to the code rules.

When the approved reply to an inquiry involves a change in the code rules, the ruling is made public through the issuance of a "case". This is published in *Mechanical Engineering* and issued to all subscribers of the ASME Piping Code Interpretation service. Other items involving revisions are usually handled on the basis of issuing revisions to the code once each year. Suggestions for revisions may originate within the committee itself or from anyone outside the committee.

All requests for interpretations or suggestions for revisions should be addressed to the Secretary, ASA Committee B31.1, 420 Lexington Ave., New York 17, or to that committee in care of the American Society of Mechanical Engineers, 29 W. 39th St., New York 18.

The ASME maintains a revision and interpretation service pertaining to the Code for Pressure Piping. The current annual fee is $2.

Case 16 interpretation has just been issued. Previous case interpretations have appeared in HPAC from time to time as soon as they have been made available, through the courtesy of the ASME and the code committee.

Case 16

Inquiry: Are the requirements contained in Section 9.3, Specific Minimum Requirements for Refrigerant Pipe and Tubing of the new Safety Code for Mechanical Refrigeration B9.1-1953, also required by Section 5, Refrigerant Piping, of the B31.1, Code for Pressure Piping?

Reply: The refrigeration section of the Code for Pressure Piping has taken action to bring the requirements of paragraph 516 into harmony with the new 1953 edition of the B9 Safety Code for Mechanical Refrigeration.

Until such time as a new edition of the Code for Pressure Piping is issued, the new wording of paragraph 516 should be complied with.

516. Specific Minimum Thickness Requirements for Refrigerant Pipe and Tubing.

(a) *Steel and Wrought Iron Pipe*: Standard wall steel or wrought iron pipe may be used for design working pressures not exceeding 300 psig, provided lap welded, electric resistance welded or seamless pipe is used for sizes 2 in. and larger and extra strong wall pipe is used for liquid lines for sizes 1½ in. and smaller, conforming to ASA B36.10.

(b) *Standard Pipe Size Brass and Copper Pipe and Tubing.* Standard pipe size copper and red brass (not less than 80 percent copper) may be used and shall conform to ASTM Specification B-42 for copper pipe and ASTM Specification B-43 for red brass pipe.

(c) *Water Tube Size Hard Copper Tubing.* Water tube size hard copper tubing used for refrigerant piping shall conform to ASTM Specification B-88 Types K or L for dimensions and specifications except that copper tubing with outside dimensions of ¼ in. and ⅜ in. shall have a minimum nominal wall thickness not less than 0.030 in. and 0.032 in., respectively.

(d) *Soft Annealed Copper Tubing.* Soft annealed copper tubing used for refrigerant piping shall not be used in sizes larger than ⅞ in. OD (¾ in. nominal). Soft annealed copper tubing shall conform to ASTM Specification B-68 or ASTM Specification B280T and the minimum nominal wall thicknesses shall be as follows:

Outside diameter, in.	Wall thickness, in.
¼	0.030
⅜	0.032
½	0.032
⅝	0.035
¾	0.042
⅞	0.045

(e) *Small Copper Tubing Exception.* Hard copper tubing and soft annealed copper tubing up to and including ½ in. outside diameter used in factory assembled piping may have wall thicknesses 0.004 in. less than the thicknesses specified in paragraphs (c) and (d).

Table 40 — List of Material Specifications

Add under *Tubing* — Non-ferrous:

Seamless copper tube for refrigeration field service	ASTM B 280T

Table 42 — Allowable S values to be used in Formula 13 for Pipe & Tubing in Refrigerant Systems.

Change last three designations as follows:

**Brass pipe, seamless red brass	ASTM B43	7000 lb
**Copper pipe, seamless	ASTM B42	6000 lb
**Copper tubing, seamless	ASTM B88)	6000 lb
	ASTM B68)	
	ASTM B280T)	
	ASTM B75)	

**Brass pipe, copper pipe seamless, copper tubing seamless, temperature limit 250 F.
ASTM B75 not recommended for refrigerant piping.

Case 13 (Re-opened)

Inquiry: What is the status of the Report of the Task Force on Flexibility, February 25, 1954, as it relates to the previous report of May 4, 1953, and paragraph 620 in the 1951 edition of the Code?

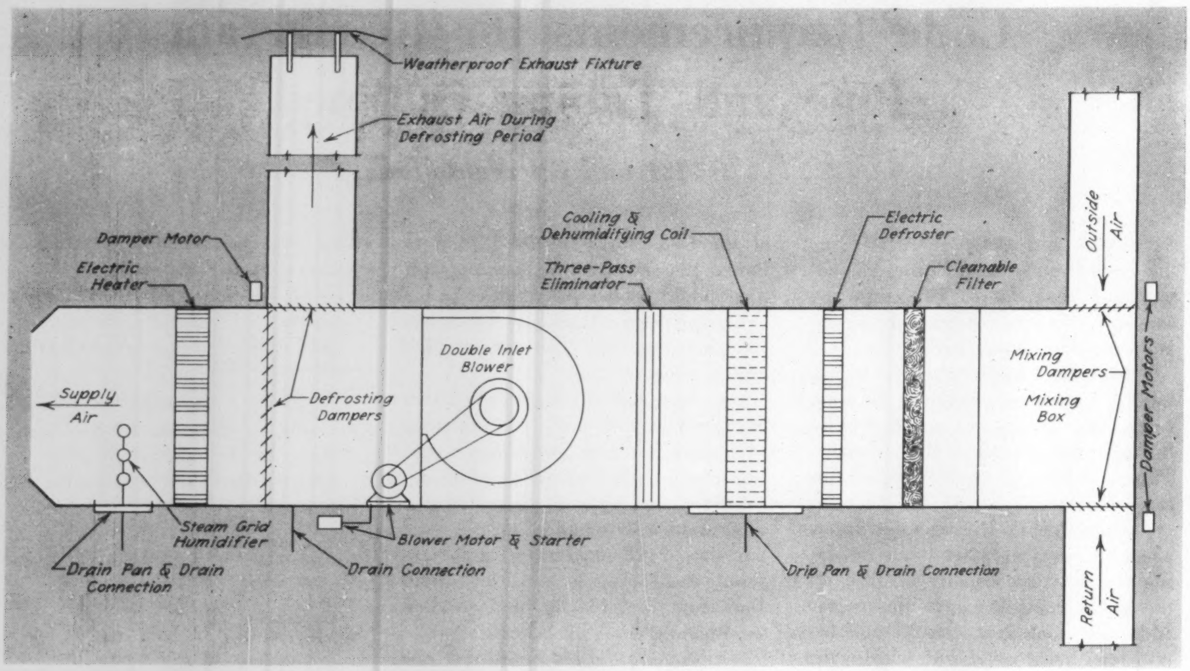
Reply: It is the opinion of the Committee that in view of the February 25, 1954, report being the final opinion of the Task Force on Flexibility, that until the new 1955 edition of the Code for Pressure Piping is published revising paragraph 620, the new February 25, 1954 report should be used in designing any new projects.

For designs already completed and those in progress, any one of the following procedures will meet the intent of the Code as it applies to piping flexibility:

(a) Follow the present wording of the Code, paragraph 620.

(b) Follow the proposed revised wording given in the Report of Task Force on Flexibility, May 4, 1953.

(c) Follow the proposed wording in the above task force report, except using the alternate paragraphs contained in the report.


Weatherproof Exhaust Fixture
Exhaust Air During Defrosting Period
Damper Motor
Electric Heater
Cooling & Dehumidifying Coil
Three-Pass Eliminator
Electric Defroster
Cleanable Filter
Outside Air
Double Inlet Blower
Supply Air
Defrosting Dampers
Mixing Dampers
Mixing Box
Damper Motors
Steam Grid Humidifier
Blower Motor & Starter
Drain Pan & Drain Connection
Drain Connection
Drip Pan & Drain Connection
Return Air

1 THIS TYPICAL AIR TREATING unit shows the plenum design for testing laboratories requiring simulation of cold dry and hot wet climatic conditions

Designing the Test Room

. . . air conditioning system

By F. F. Stevenson

• This article is the second of a group which describes the details and factors that a design engineer must consider in laying out and installing air conditioning systems for product testing laboratories. The first appeared in the March HPAC. This month, such factors as humidity control, air flow rates, coil selection and duct construction are described in some detail. Actual installations and experiences are referred to — and what had to be done to correct some problems that developed in the operation of the systems. These articles are based upon the author's personal experiences in designing such installations.

As MENTIONED in my first article, it is often desirable to design and build up the air conditioning units from individual components for the particular function and requirement that is desired to serve the product testing laboratory, to provide the essential flexibility in such an application. The general considerations in designing such a system were discussed in the March article and this month, specific installations are described with some of the problems that were encountered and solved when the systems started to operate.

The system should be provided with properly sized fans, cooling coils, defroster and filters. Also, the system should have a heater and humidifier. The component parts of such a system are shown schematically in Fig. 1.

One System Design Described

In one installation, the heater was

Mr. Stevenson has contributed many articles to HPAC for over 15 years. He is a design engineer who has had wide experience in heating, ventilating and air conditioning. He has been engaged in contracting work and also with several engineering and architectural offices.

designed to act as a reheater during the cool dry cycle and as a straight heater during the hot wet operation. An electric duct heater was chosen because steam or hot water coils could not be used. It was deemed inadvisable to subject the cooling coil to the radiant heat of the heater, so the latter was installed in the duct on the discharge side of the fan, with the humidifier just downstream from it. This decision was made before the eliminator was installed. The heater was a series of five strip heaters, each strip having its own control switch.

A pneumatic-electric switch was installed between the air control and the electric current to each strip, using an ascending and descending sequence of air pressure to provide step control of the heater. Such a control has been used in other installations, and it usually provides sufficient flexibility to afford a satisfactory modulating heating cycle. However, in this case, continuous overruns and underruns were experienced. The heating load only required about a 30 F temperautre range, but the space temperature tolerance was close and the step arrangement did not provide a sensitive enough control.

To correct this situation, the step control was removed, and the entire heater was put on one circuit, controlled by a transformer voltage regulator. The control air was piped to a piston type damper motor, and the piston rod of the motor was hooked up to the lever arm of the voltage regulator. This operated very well and provided a close control of the dry bulb temperature. A similar arrangement could be made with an electric control system, using a motorized voltage regulator installed in the electric control circuit.

Humidifier Selection

The humidifier was of the steam grid type, supplied with steam from a small generator, independent of plant steam. From the standpoint of low first cost, small space requirements and simplicity of operation and control, the steam grid humidifier was satisfactory. Its operation in a plenum or an air duct does not appreciably increase the dry bulb temperature of the air supply. Spray type humidifiers have to be cleaned frequently, and they may add entrained moisture to the air stream and cause corrosion on the coils. Also, when the water is fairly warm, they add considerably to the sensible heat of the air stream. Pan type humidifiers also increase the dry bulb temperature of the air. They are sometimes bulky, and they often require controls and frequent service.

When the steam has an odor, as it sometimes does, a steam grid humidifier cannot be used. However, in many cases, steam presents no odor problem. In one installation, a steam grid humidifier is operating in a plenum serving a television studio which is supplied with steam by boilers which are about 25 years old, with no trace of odor in the supply air. The steam generator is an electric type, a kind widely used, and it performs satisfactorily.

For the hot wet cycle, the air was heated to the required point and steam was supplied to the humidifier to maintain the design condition. The steam was supplied through a modulating, normally closed type of pneumatic valve, and so installed that when the fan stopped, the valve would close.

Spray Nozzles Used

For the hot wet cycle, several test rooms have been observed where moisture was supplied through spray nozzles by using warm water and delivered to the space in the form of a fine mist. If there is no objection to a certain amount of entrained moisture particles in the air, this is an excellent method. The control is simple, and if the spray nozzles are kept clean, such a system operates with little trouble.

Of course, the spray heads must be installed properly if an even distribution of moisture throughout the space is to be obtained. Such a system is not always suitable, however, when no water can be permitted in the space, except of course that which may collect on the walls and floors, due to condensation. Water will also collect on the ceiling if the ceiling surface temperature is below the dew point of the space. If this is the case, dripping from the ceiling may cause damage to the materials being tested. One method of correcting this problem is to install a heavy lighting concentration on the ceiling.

Air Distribution System

The air distribution system for the test room consisted of a short duct from the discharge of the air conditioning unit into the room, with two ceiling diffusers. The duct was installed in a furred in space above the suspended ceiling.

The ductwork also included the reheater plenum section and the humidifiers, as previously mentioned. Two return air intakes were in the wall at the floor level. Of course, it is important that the intakes are not covered by laboratory or testing equipment after the room has begun to be used. The air was returned to the unit through ducts and was admitted to the mixing chamber in the rear of the unit, where outside air could also be admitted. The outside air duct was sized for 100 percent of the air supply.

Mixing dampers were provided as well as an outside air shutoff damper. These dampers were manually controlled for mixing purposes and automatically for the defrost cycle. The return air intakes were provided with a key operated damper. Close to the discharge of the unit and ahead of the heater, a vertical duct was installed leading from the main supply duct. This riser went up through the roof and carried off the moisture laden exhaust air during the defrosting period, discharging it through a roof outlet.

Later it was realized that a second fan connected to the return air duct for removing air from the room would be helpful in clearing the room during the changeover from the hot and wet condition to the cold and dry condition. Without the second fan, it was necessary to open the doors and draw in air from the surrounding spaces for exhaust purposes. The air traveled through the return air intakes and ducts to and through the unit, and then out through the defrosting exhaust. This was an unsatisfactory arrangement as compared with the use of a separate exhaust fan and duct.

The third article of this group will be devoted to a complete description of control systems for test rooms and the problems encountered.

PLANNING THE UNDERGROUND utilities for shopping centers — such as drainage for parking areas — is a most important step in the development of such projects

Planning the Shopping Center

Underground Utilities

By R. J. Abramson
R. J. Abramson & Associates
Consulting Engineers

• This is one of a group of articles on the factors to be considered in planning a modern shopping center, with particular emphasis on the air conditioning, heating and piping facilities. An overall approach to the problem was presented in April, with a general outline of the engineering considerations. Subsequent articles will be devoted to detailed descriptions of several shopping centers, the designs of the mechanical equipment for which the author's staff has completed.

THE DICTIONARY defines "organize" as "to arrange or constitute in interdependent parts, each having a special function or relation with respect to the whole." This definition describes exactly the planning necessary to develop a shopping center in order to relate the necessary component systems into a profitable, operatable installation. A general outline of engineering considerations in planning shopping centers was given in the April HPAC.

The classic statement that specifications ". . . shall comply with all codes, rules and regulations of 'Blank City' and all regulations and rules of the local utility company" indicates the first necessary step in planning. Most localities have readily available printed codes governing material, equipment and its installation. There is just enough difference between the individual localities to make it mandatory to obtain and closely study the provisions applicable to the design of the several systems for a shopping center.

In addition to municipal regulations, the local utility companies (gas, electric and — in some instances — water) have additional requirements; these published rules and rates should be studied before starting the base design.

Much Data Needed

It will also be most helpful to obtain from the local weather bureau the following information:

1) Maximum hourly rainfall (inches) that occurred in the prior 10 years.

2) Total monthly rainfall for the prior 10 years, inches.

3) Maximum hourly snowfall (inches) that occurred in the past 10 years.

4) Total monthly snowfall for the prior 10 years.

5) Maximum dry and wet bulb summer temperatures and the number of days they have exceeded the summer design temperatures recommended for the locality.

6) Maximum dry bulb winter temperature and the number of days it has exceeded the winter design temperature recommended for the locality.

7) Total monthly degree days for local heating season.

8) Direction of local prevailing winds for the various seasons.

9) Percentage of sunlight available in summer season for the locality (measure of cloudiness).

10) Mean dry and wet bulb temperatures for the four seasons.

The architect's site and leasing plan for the project should contain the following data:

a) Parking area finished grades, drainage and ponding contours, car parking and traffic drives.

b) Sidewalks, curbs and arcades and their final elevations.

c) Final elevations of all building basements, floors, roofs and parapets.

d) Sales space divisions for mercantile units.

The Underground Utilities

Familiarity with the governing local codes, utility regulations and the architect's design will direct the engineer's attention to one of the first problems — underground utilities. These utilities have a close relationship with air conditioning, insofar as the disposal of condensing water is concerned.

As many localities have separate storm and sanitary systems, we will assume this to be the case in "Blank City". Conferences with the architect reveal that it is desired to eliminate overhead power poles, to have 1 foot-candle illumination for car parking areas and 3 foot-candle illumination for pedestrian walks and street drive entrances, illuminated canopies over sidewalks designed for 20 foot-candles, and a public address system in all sales spaces, canopies and certain portions of the parking area. Further, all storm water shall drain at least 25 ft normal to the sidewalk curb before entering a ponding area and drainage inlet.

The most economical storm drainage system would have a design capacity to drain the area during a normal rainfall. Greater than average rainfall would be stored or "ponded" when the capacity of the drainage system is exceeded.

For example, consider an average yearly rainfall rate of $\frac{1}{2}$ in. per hr, a maximum once-a-year rate of $1\frac{1}{4}$ in. per hr, a maximum once-in-five-years rate of $2\frac{1}{2}$ in. per hr, and a maximum once-in-10-years rate of $4\frac{1}{2}$ in. per hr. Re-stating these values in cubic feet per second, they are 0.51, 1.26, 2.5 and 4.5, respectively, *per* 100 *percent run-off acre*. If the storm system is designed for a continuous flow of 1.26 cu ft per sec (with a suitable gradient) and a ponding volume of 6925 cu ft (difference in volume between the $1\frac{1}{4}$ and $2\frac{1}{2}$ in. rainfall rates, cu ft per hr) for each acre, $2\frac{1}{4}$ in. rainfall can be drained off $1\frac{1}{2}$ hr after cessation, including ponded water.

The ponding area for the acre could be a 163 ft diameter circle continously pitched down to the center a distance of 1 ft. Should that once-in-10-year rain happen, the system would drain off the storm water in $2\frac{3}{4}$ hr after the rain stopped. Obviously, a system designed for the yearly maximum rainfall with suitable ponding for the five year maximum rain would be flooded only once in 10 years, and then only for $1\frac{1}{4}$ hr.

A study of rainfall charts indicates that maximum economy can be effected by sizing the pipe for 78 percent of the maximum yearly rate with ponding areas designed to contain the five year maximum with approximately a 2 hr draining period. Drainage lines that are designed to

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Denver Swinging To Air Conditioning

. . . several big jobs

One of Denver's oldest department stores, the May Co., is being completely air conditioned, according to Charles V. Fenn, vice president of the Carrier Corp.'s machinery and systems division. It will be the first large store in downtown Denver to have air conditioning throughout, says R. A. Galbasin, store manager.

"Customer comfort was not our only reason for installing air conditioning," according to Mr. Galbasin. "Good employees are worth dollars and cents in terms of sales, customer relations and training. For that reason we are air conditioning the entire store, including stockrooms and employee locker rooms."

Small portions of the store — including the basement, beauty parlor and part of the mezzanine — were individually air conditioned by self-contained equipment during the last eight years.

Two large centrifugal refrigerating machines totalling 750 hp are being installed.

The architects are Raymond Harry Ervin and Robert Berne. The consulting engineer is Marshall and Johnson, and the general contractor, Meat and Mount.

The first completely air conditioned major office building in Denver is the ultra-modern Stearns-Roger Mfg. Co. building. Another large air conditioning installation in the city is the 19 story Denver Club building.

The increase in big building air conditioning in Denver reflects a nationwide trend, according to Mr. Fenn.

The new five story Stearns-Roger structure has heat resistant glass windows which provide maximum natural light practically surrounding the building at each story. Horizontal and vertical shading devices prevent the direct rays of the sun from entering the building during regular working hours. The combination of specially treated glass and shading is expected to save more than 10 percent in air conditioning capacity required. Cooling for the 100,000 sq ft building will be provided by a centrifugal refrigerating machine installed in the basement.

Architectural work was performed by Stearns-Roger. Engineering was also performed by this company in conjunction with Roger Musick, all of Denver.

New Method Detects Very Small Leaks

. . . uses helium

As a result of investigations of materials to be used in atomic energy applications, a technique has been devised which enables scientists and engineers to detect a leak so small "that it would take a year to form a single drop," according to L. S. Wilcoxson, vice president in charge of the research center of the Babcock & Wilcox Co. at Alliance, Ohio, where the technique was perfected.

In the method, the vessel being tested is filled with helium. Then, through the use of a mass spectrometer leak detector, the amount of helium that escapes into the surrounding atmosphere is measured. In this way, it is possible to detect the presence of one part of helium in 200,000 parts of air, he said.

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run full once a year, and at water velocities above 1 ft per sec, tend to be self-cleaning and trouble-free.

Draining Parking Areas

Much has been written about catch basins, manholes, curb drains and other appurtenances and need not be repeated here. The designer should bear in mind that cleaning of the lines is necessary and that rods in excess of 250 ft tax the strength of two men — why not, therefore, keep manholes within these limits? Catch basins without sumps will not catch anything! A day spent at any operating shopping center will forcibly point out the amount of rubbish left by the public, on the parking lot — all to be washed down to the ponding areas and then into the catch basins. Gratings should be used so that this rubbish won't clog the openings.

If the parking lot is gravel with black-top surfacing, several drain pipes should extend from the gravel sub-base into the manhole and catch basins to provide water drainage from the gravel. Black-top has only 80 percent or less run-off — 20 percent or more rain water will seep through into the gravel and tend to undermine the sub-base, a cause of paving failures.

In addition to parking lot drainage, the storm system must carry the roof drainage and, in certain instances, air conditioning condenser cooling water. As much present-day construction is flat roof — some pitched and some dead level — the designer should assure minimum downspout trouble by using domed strainer roof drains with gravel stops and roofing clamping rings. Tar and gravel flat roofs pitched in excess of $\frac{1}{4}$ in. per ft should have accessible gravel basins at the base of each downspout. Dead level roofs with overflow scuppers on exterior walls will cause water marks and discoloration on color glazed face brick and should be avoided.

A method of estimating air conditioning condenser cooling water will be given in a subsequent article. The addition of roof drainage water and condenser water to the previously discussed parking area storm water will give the total maximum carrying capacity of the storm system. Pipe sizing can then proceed.

The sanitary system is quite another matter. As most local codes define the population of a mercantile space (for example, 30 sq ft floor space per person on first floor; 60 sq ft floor space per person in basement; etc.) and then define the number of people per water closet, urinal, lavatory, etc., it is only necessary for the designer to convert "fixtures" into "fixture-units" as given in the local code, or to use the information given in the *Guide* of American Society of Heating and Ventilating Engineers, or in the U.S. government bulletin BMS-66.

The question of whether to use loop or circuit venting, when to revent, etc., is entered into in great length in practically every local code; each code being sufficiently different in context and practice as to warrant close scrutiny and at least one personal visit with the official charged with its enforcement.

Two Suggestions

There are two last suggestions. Connecting footing or foundation drains directly to the storm system should be avoided to prevent damp, musty basements or possibly wet basements. A positive means of control should be used, such as a sump pump or flow control valves.

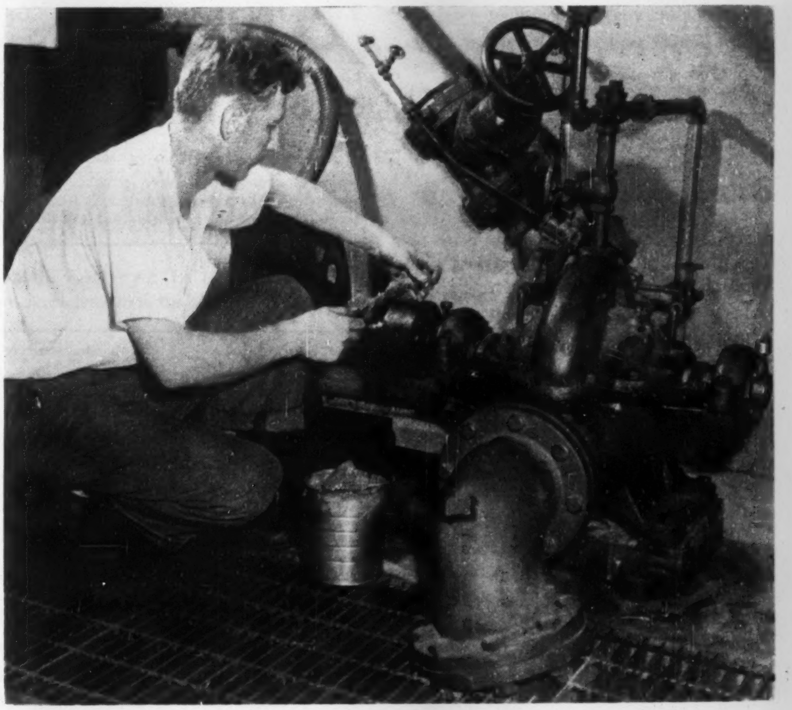
If the project is located in some southeastern city, both the storm and sanitary system designs should be checked with the proper officials for mosquito control. There may be city standards on pipe sizes, inlets, etc., for the control of fever carriers.

Experience at One Center

At a shopping center on the northwest side of Chicago, a storm system as previously described has been in operation for three full years. It drains approximately 11 acres of black-top parking area to two main laterals, which in turn discharge into the drainage canal. The ponding area contours are kidney-shaped to permit certain drives and pedestrian walks to be accessible under all conditions except the 10 year maximum rainfall (which has not as yet been experienced). The parking and access drive layout required 15 ponding areas; each catch basin is designed to handle 0.80 cu ft per sec of rain water. The ponding area will store all the water from a $2\frac{1}{4}$ in. per hr rain of 1 hr duration, with accessible walks and drives.

Quite by chance, certain catch basin gratings were removed immediately after a rainfall. Streams of water were pouring out between the vertical brick joints on the first three courses below the manhole frame. Examination showed that the water seepage through the fissures in the blacktop paving flowed through the gravel sub-base, eroded the mortar between the bricks, and discharged into the several basins. After installation of "weep" tile, traffic depression of manholes and paving chuck-holes practically ceased.

Experience showed that the 12 ft wide canopies over the sidewalks kept all but the drift snow off. Two light snow plows cleared six acres of parking, and piled the snow along the canal for final removal, in one 8 hr day. Light snow falls were merely left on the ground, as traffic and sunlight usually cleared the area in a day or two. The problem of snow removal is over-emphasized, in my opinion, for areas having a snow fall rate similar to that of Chicago, especially if this rate is translated to mean two average snows of 6 to 8 in. depth, each, per winter! The merchants did not object to sweeping the snow off their portions of the canopied sidewalks.



ONLY ROUTINE MAINTENANCE is required in keeping a new pump operating, while keeping an old one running may be excessively expensive

When Does It Pay To Replace a Pump?

By C. E. Cromwell
De Laval Steam Turbine Co.

• The hidden costs of operating an old pump include power, depreciation and maintenance, which may be higher than the price of a modern replacement. It may be economical to replace the old pump with a new one. Several helpful points are outlined here to determine the advisability of replacement.

DIGGING INTO THE economics of operating an old pump can turn up highly profitable information. The appearance of satisfactory performance may be hiding real costs which may represent the price of a modern pump along with other appreciable savings.

A pump may still be delivering the designed capacity and head in spite of its age. It is this fact, the seemingly satisfactory performance of the pump, that protects its reputation as an "old faithful" from closer scrutiny. Gradual decreasing efficiency is not as noticeable as a sudden breakdown. Power costs are not looked upon as excessive unless totaled up over a number of years and compared with similar costs for a new pump. Pump manufacturers have come a long way in designing units to reduce operating costs.

Pump Efficiency a Factor

Consider a motor driven pump built in 1928 to deliver 2500 gpm against a total head of 150 ft. When originally built, the efficiency was 78 percent, which required an input of 121 bhp. Due to wear and tear, and if no revolving parts have been replaced, it could be expected that the pump in 1953 would have an efficiency of about 74 percent, and would require 128 bhp to deliver the designed capacity and head.

A modern pump for these same conditions could be expected to have an efficiency of 86 percent, which would require 110 bhp. This is a possible saving of 18 bhp. Based upon a power cost of 1c per kwhr, the savings in power cost for one year — 8760 operating hours — would be $1176.

New Pump Pays For Itself

The cost of a new pump or complete unit, and the time that it would take to pay for it from the operating savings gained over the old pump are shown in Table 1. The figures are based on the rate of 1c per kwhr, or $0.00746 per hp. Additional costs for freightage and for changing the foundation and piping should be added to the total cost figure.

Even if renewal parts for the 1928 pump could restore its original efficiency of 78 percent, it will still require 11 hp more than the new pump. Based upon 8760 hr of operation per year, the power cost of the old unit will be $719 more. Depending on how obsolete the pump parts are, they might be relatively expensive, compared with the cost of a modern pump.

What Write-Off Time?

If the amount saved each year on power cost were set aside to accumulate interest, the total will then represent an amount that will pay for all or part of the cost of a new unit. If a company's practice is to consider relatively long term write-offs, these savings may well be sufficient to pay for the new unit and also for other additional capital expenditures.

A municipality figures in terms of 15 yr or more and at interest rates of possibly 3 percent. A small annual saving, shown in the above example, soon pays for the original investment. In fact, many cases show that by the end of a 15 yr term, such savings would represent the write-off of a much larger capital expenditure. Take the $1176 saved on power cost with a new pump, as shown. If for a municipality, this amount were set aside to accumulate interest at 3 percent compounded annually for 15 yr, a capital investment of $21,871 would be written off.

Some operators of central station power plants believe that in a new station, a unit that pays for itself in 8 to 10 yr is a good investment. When replacing old equipment, the expected life of the plant may reduce the length of write-off that can be considered. This premise should be considered throughout industry, regardless of the products.

Some chemical refineries, for instance, prefer to write off investments in 3 to 4 yr, or possibly 2 yr. As an example, a chemical company capitalizing the savings at 4 percent for 4 yr could write off an investment of $4994.

Calculating Savings

Calculation of power cost savings and capitalization amounts can be made quickly by using the chart published as the Data Sheet in this issue (pp. 133-134). This chart can be used for quick approximations and can be read within about 2 percent accuracy. Several examples are cited along with the chart, illustrating the application and results obtained.

TABLE 1—DETERMINING THE COST of a new pump and the time that it would take to amortize it based upon the savings from the operating costs over the old pump

Estimated price of new pump, base, coupling			$1238
Estimated price of 125-hp 440 volt 1750 rpm motor			1390
Estimated price of reduced voltage starter			1170
Total cost of new pump, motor, starter			$3798
Hours of operation per year	8760	6500	4000
Savings will pay for pump, base and coupling in	13 mo.	17 mo.	28 mo.
Savings will pay for complete unit in	39 mo.	52 mo.	84 mo.

TABLE 2—ANNUAL SAVINGS divided by the factors in the table equals a sum including the interest accumulated for a number of years and the interest rate selected

Years	Interest rate per annum, percent, compounded annually				
	2	3	4	5	6
2	0.49505	0.49261	0.49020	0.48780	0.48544
3	0.32675	0.32353	0.32035	0.31721	0.31411
4	0.24262	0.23903	0.23549	0.23201	0.22859
6	0.15853	0.15460	0.15076	0.14702	0.14336
8	0.11651	0.11246	0.10853	0.10472	0.10104
10	0.09133	0.08723	0.08329	0.07950	0.07587
12	0.07456	0.07046	0.06655	0.06283	0.05928
15	0.06260	0.05377	0.04994	0.04634	0.04296

When accurate calculations are required for formal presentation, annual savings are obtained by multiplying the horsepower savings by yearly hours of operation times the cost per horsepower hour — kwhr cost in cents × 0.746. The annual savings divided by a factor, based upon terms of years and interest rate will give the capitalization amount. Table 2 lists these factors for various terms and interest rates. These can also be used for terms other than those shown on the chart.

Consider Hidden Costs

Undoubtedly, plant engineers in industry and municipalities realize that the hidden costs of operating old equipment could very well represent the purchase price of new equipment. However, management officials often have to be shown why the purchase of modern equipment is a wiser investment than the continuing costs of operating old equipment. In some cases, the actual cost factors of operating old equipment are obscured because power costs are negligible, where power is obtained as the byproduct of some process, or the unit may be fully depreciated.

If power and depreciation are negligible factors, which is seldom the case, there are still repair costs to consider. Obsolete parts are more expensive and require extended delivery time. Should production losses occur because of the delay in obtaining obsolete renewal parts, the losses may be charged to the old pump. The cost of modern renewal parts for which patterns are available and the parts are in stock represent very tangible savings when compared with the cost of obsolete parts. Sometimes a modern pump can be purchased at prices equal to or even less than the cost of extensive renewal parts for an old pump.

The chart and examples shown here could help engineers give management officials a graphic insight into economics of depreciation, deterioration and obsolescence for a particular installation in their plants. They will also show how the higher operating costs entailed by these three factors could be converted into appreciable savings to make modernization pay its own way.

Confer on Servicing Automobile Conditioning

. . . RACCA suggestion

THE NATIONAL Automobile Dealers Association and the Automobile Manufacturers Association have been invited to select a committee to meet with a like committee from the Refrigeration and Air Conditioning Contractors Association toward establishing stations for servicing and installation of automobile air conditioning in the field by qualified mechanics.

The RACCA has opened a national office in Cleveland. Ray Kromer, executive vice president, operates from this office at 2108 Keith Bldg., 1621 Euclid Ave., Cleveland 15. The business office of RACCA remains in Chicago at 228 N. LaSalle St.

Calculating Savings When New Pump Replaces Old One

Outlined here, are several examples in which a helpful chart is used to determine the costs involved in replacing pumps. The article, When Does It Pay To Replace a Pump? by C. E. Cromwell, on pages 131-132 covers additional detailed information about this subject.

Chart Used to Estimate

Calculation of power cost savings and capitalization amounts can be made quickly by using the chart on the next page. First, compute the horsepower savings and multiply the results by yearly hours of operation. This chart can be used for quick approximations and can be read within about 2 percent accuracy.

The diagonal lines represent "horsepower savings." The abcissa shows "hours per year" of operation. Reading vertically up the "hours per year" to the "horsepower savings," to the left ordinate is the "annual savings" in power cost, and to the right ordinate is the "capitalization amount." Shown are three right hand ordinates, each for different interest rates and terms of years.

The chart is based on cost of power at $0.01 per kwhr. If in a particular locality power cost is more or less, simply multiply answer from the chart by the ratio to actual cost — if the cost is 12 mils per kwhr, multiply by 1.2, and the cost is 9 mils per kwhr, multiply by 0.9.

Three Examples Cited

The following examples are taken from records to show what improvements in efficiency have been made and the savings and capitalization amounts are taken from the chart on the next page.

Chilled Water Pump — Consider a pump installed in 1926 which has been delivering 400 gpm against a total head of 200 ft operating at an efficiency of 70 percent with an input of 28.9 bhp. A modern pump will operate under the same conditions at an efficiency of 79 percent with an input of 25.6 bhp. This represents a saving of 3.3 bhp. The annual saving if the pump is operated 6000 hr per yr would be $150. The annual savings capitalized in 4 yr at 4 percent interest represents a total of $630. The estimated cost of a new pump operating under these conditions would be $438.

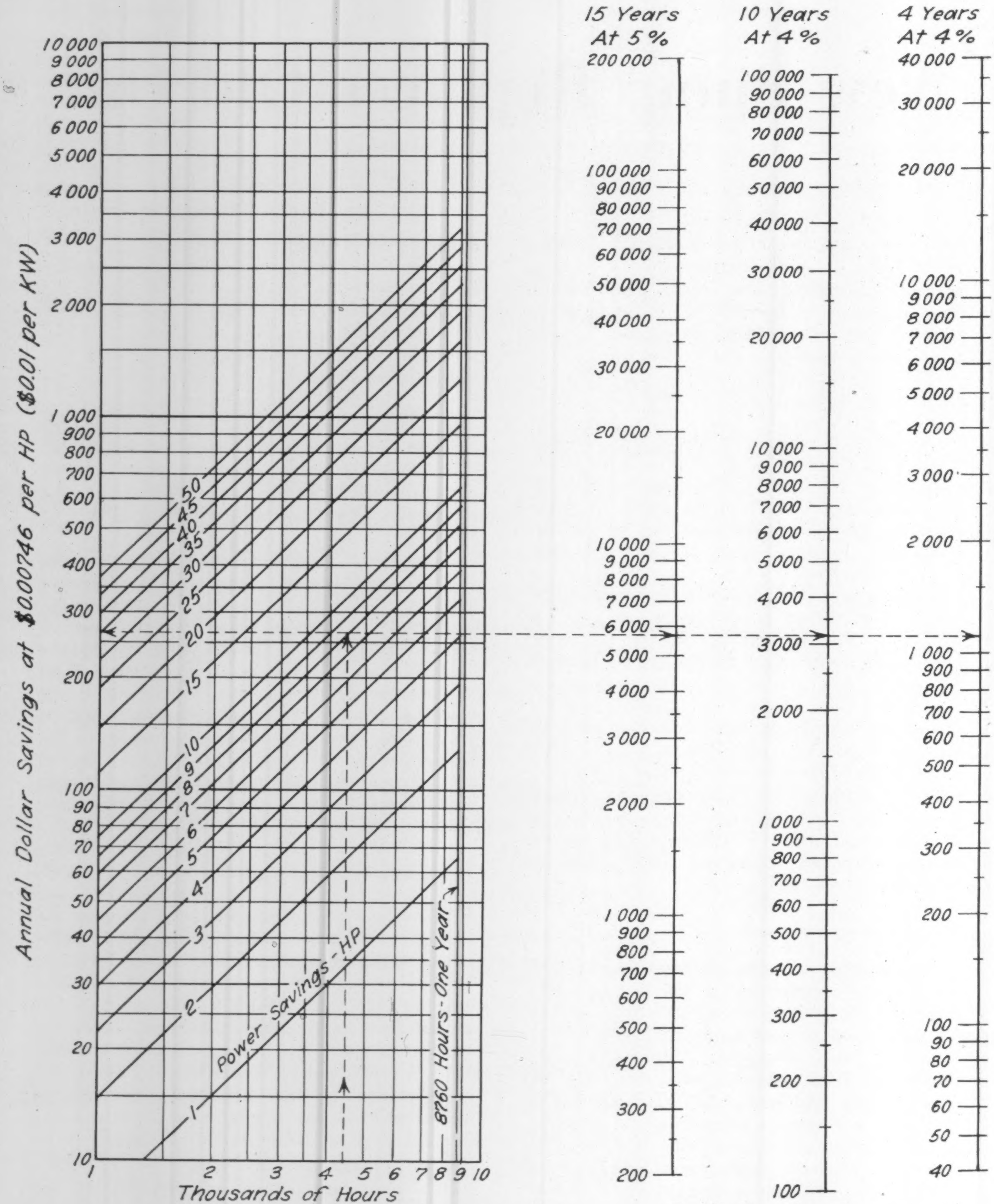
Boiler Feed Pump — Consider a pump installed in 1930 which has been delivering 400 gpm at 220 F against a total head of 650 ft, operating at an efficiency of 63 percent with an input of 99. 5 bhp. A modern pump will operate under the same conditions at an efficiency of 69 percent with an input of only 91.0 bhp. This represents a saving of 8.5 bhp. The annual saving if the pump is operated 8760 hr per yr would be $560. The annual savings capitalized in 10 yr at 4 percent interest represents a total of $6700. The estimated cost of a new pump operating under these conditions would be $1101.

Water Works Pump — Consider a pump installed in 1926 which has been delivering 15 million gal per day — 10,400 gpm — at a total head of 200 ft, operating at an efficiency of 84 percent with an input of 625 bhp. A modern pump will operate under the same conditions at an efficiency of 89 percent with an input of only 590 bhp. This represents a saving of 35 bhp. The annual saving if the pump is operated 5000 hr per yr would be $1300. The annual savings capitalized in 15 yr at 3 percent interest represents a total of $24,177. The estimated price of a new pump operating under these same conditions would be $4054.

Table May Also Be Used

When accurate calculations are required for formal presentation, annual savings may be obtained by multiplying horsepower savings by yearly hours of operation times the cost per horsepower hour — kwhr cost × 0.746. The annual savings divided by a factor, based upon terms of years of interest rate will give the capitalization amount. Table 2 in the article, When Does It Pay To Replace a Pump? on pages 131-132 lists these factors for various terms and interest rates. These can also be used for terms other than those shown on the chart.

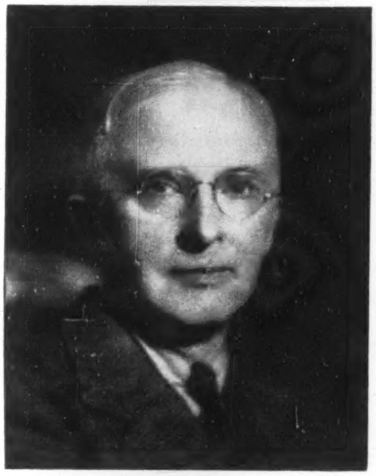
It is recognized that the rates of interest and write-off terms cited in these examples may not apply equally to every municipality, utility or industrial plant. Table 2 gives the factor to use for specific cases.



THIS CHART may be used in calculating the savings that may be experienced when a new pump replaces an old one. Several examples showing the use of the chart are given on the previous page

SAM LEWIS' PAGE

Recalls Early Heating Practice



SAMUEL R. LEWIS, consulting mechanical engineer and a member of HPAC's board of consulting and contributing editors, comments informally each month on practical heating, piping and air conditioning problems. This month, he recalls some of the early heating practices and methods for large buildings together with the problems that accompanied these early developments.

I REMEMBER 50 or more years ago when heat transmitters located in offices and rooms were made of cast iron sections that were assembled with steel push nipples. In those days, one occasionally saw heat transmitters that were made of 1 in. pipes installed in the vertical position which were screwed into threaded openings in cast iron horizontal bases. Also, there were many buildings with rooms that were heated by horizontal pipes— usually 1 in. in diameter — installed in several layers along the outer walls or laid flatwise overhead.

Steam was almost the universal heat medium in those days. Since no two pipes in the radiators would receive steam at exactly the same time, it was always necessary to build right angle turns into the pipes to permit different rates of expansion of such assemblies, at each end.

There were not many flange unions or box unions, and when such unions were used, they always required gaskets. Box unions, as we know them today, were called railroad unions. The brass insert on one side of a ferrous pipe union that avoids a gasket had not yet been developed, as I remember.

The usual means of making final connections was by right and left threaded elbows and by right and left couplings. To make up a joint, the coupling — for example — had to be first screwed tight to each pipe as a separate operation and then unscrewed. It was necessary to remember the number of turns to release the coupling from each pipe. If the right hand thread became tight in five turns, while the left hand thread required seven turns, then the left hand pipe had to be turned two revolutions into the coupling before the pipe with the right hand thread could be "invited" to enter the coupling. Failing to test, mark and to back count these revolutions of the coupling would result in a leak, because one or the other of the joints had to be tight before the other could be tight.

The cast iron sections of a steam radiator originally were connected, each to the other, at the bottom only, to permit drainage of condensate.

Connect at Top for Hot Water

When hot water was the heat carrying medium, it was necessary to connect the radiator sections at both top and bottom. Without these top connections between the sections, the water could not circulate. When it is desired to convert the heating system of some old building to circulate water rather than steam, it is always essential that the radiators are of the top connection type.

Seeking a more handsome wall radiator, an old eastern manufacturer developed a cored cast iron flat slab radiator section. It was rated at 5, 7 or 9 equivalent sq ft of steam radiation. These rigid sections, when assembled in long radiators and when set vertically along a wall, oftentimes became the warmest at the top. Thus, more expansion occurred at the top than did the less-hot bottom. Of course, this unequal expansion caused leakage at the connecting nipples along the bottom.

In 1900, there were many cities with public electric service— but electric energy was expensive and sometimes was available only after dark. Sometimes, fans for ventilating were operated by water wheels using city water, which was wasted to the sewer. Also, a few reciprocating hot air engines were available that developed a little power from the expansion of air heated by gas burners. The Otto cycle in a gas engine was coming along strong. Rudolph Diesel was not yet clicking.

Unit Heaters Developed

I remember hearing about the very early unit heaters. One could take an overhead device that looked like a modern automobile radiator which was supplied with steam to heat it and equipped with a fan behind it to circulate room air over the coils, and with this device it could be expected to transmit as much heat as that delivered for triple the same amount of cast iron radiation. We used to operate the fans of these heat transmitters with steam engines and condensed the exhaust steam in the heating coils. Steam turbine driven units are used today, but most units are equipped with electric motors.

Design of modern air conditioning systems for large buildings requires constant consideration of whether to employ central cooling apparatuses — with relatively long ducts — and concentrated refrigeration, or to install several self contained unit coolers, each with its own separate condensing equipment, evaporator and fan. There are interesting and important features of value in each type, but there seems to be a trend toward increasing the use of unit type heating apparatuses as well as of unit type cooling apparatuses.

ANYTHING CAN HAPPEN

Operating Man Accuses Stop-Check Valves Falsely

By Bill Dopp

• Almost anything can happen when you're in the engineering, operating, contracting or sales ends of the heating, piping and air conditioning industry. The objective of this more-or-less regular editorial feature in HPAC is to discuss practical problems that need solving — and ways to solve them.

Bill Dopp has had some 40 years of experience dealing with piping, including a long stretch of service as a sales engineer. He is devoting part of his present leisure to drawing on his many piping experiences.

This month, Mr. Dopp's principal character, Martin MacVane, helps some of his friends at an old food processing plant to clear up a problem involving stop-check valves which seem to have too much pressure drop.

"MAC, I RECENTLY BOUGHT two new stop-check valves that are giving me all kinds of trouble," said Paul Vance to his old friend Martin MacVane, the gasket salesman.

"What kinds of trouble?" asked Mac.

"Well, in the first place, we really had a time getting them in. You know, this plant was built when Hector was a pup. It's been patched up and added to for ages. Nothing fits, nothing is straight." Mac smiled at the disgusted expression on Paul's face.

"For instance," Paul continued, "the two valves we took out must have been put in around the turn of the century. I finally got tired working with them. When I first came here 10 years ago, I found that they were not working, so I took them apart. You should have seen the mass of incrusted scale that had those discs locked solid. We worked for a week cleaning them up and getting them back in working order." Paul leaned back with his hands clasped behind his head. He had really made a success of keeping the old equipment running in the food processing plant for these many years, but he complained, "It's just one headache after another."

Stop-Check Valves Are Simple

"What's the particular trouble now?" asked Mac. He was used to engineers dropping their troubles into his lap. He enjoyed the experiences of finding solutions to their problems. "Stop-check valves are about as simple as anything in the plant. They do get temperamental, but that's because they aren't treated right."

"I'll say they get temperamental," declared Paul. "Take these two brand new ones. The manufacturer declares they are the best on the market. I fall for the sales talk and wind up with a couple of valves that show over 20 pounds pressure drop. When I complain to the maker, he comes back with a lot of questions about low load, high load and what not. He says the valves are too large or too small, implies that I'm ignorant. Frankly, I'm disgusted."

"Now, now, take it easy. That fellow who wrote you about the loads you are carrying knew what he was doing. Let's start at the beginning, and size this thing up. Maybe it's not as bad as you think." Mac sat down, leaned across the desk, picked up a pencil and asked, "What pressure do you carry on those boilers?"

"Here we go again," mused Paul. "We carry 150 pounds on the boilers. These old kettles were once equipped with superheaters, but we don't use them because we are using nearly all of our steam for cookers and dryers. I've got a bunch of reducing valves and regulators around the place, but that's another headache. The thing that's got me now is a 20 pound drop between the boiler drum and the header that feeds the equipment. With the old valves, we only had a five pound drop. There is something wrong with those valves." An injured note had crept into Paul's voice before he finished.

"What kind of stop-check valves are these?" asked Mac.

"They are the kind with the inverted bucket type disc that works in a slanting liner. They're called a

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All of the names in this article are fictitious.

globe stop-check. Some people think they are the best, but I'm getting nowhere with them."

What Are Loads on Boiler?

"Now, don't blow up — because I'm going to ask you the same questions that I imagine the manufacturer asked. What is your normal working load per boiler, your minimum load, your maximum load and the duration of each?" Mac had a broad grin as he put the questions to him. Paul showed astonishment.

"What do you do, Mac? Do you work for these people?" he demanded.

"No, Paul," explained Mac, "but I'm fairly well informed on what one has to know to properly size a stop-check valve and to determine the pressure drop that should develop with a given velocity. Pressure drop is a function of velocity, you know. If you carry a load that is too large for the size valve you have, then the drop will be excessive. On the other hand, if the valve is too large for the normal load, it will not open fully and the disc being in the stream will cause an excessive drop. You will have to figure all of the conditions to arrive at the correct size."

"But Mac," exclaimed Paul, "these valves are the same size as the ones they replaced. They are a different type, which seems to make the difference."

"I doubt that," declared Mac. "Now let's have those loads."

"Well, we use about 60,000 pounds per hour from the two boilers. That's 30,000 each, when we are running normally. When we are shut down with boilers banked, we use about 10,000 in the winter, for heating and hot water. Then, one boiler does the work. At times when we get behind, we have to push the boilers for all they are worth and we get up to 40,000 pounds from each kettle." Paul frowned, trying to give Mac fairly accurate information. He hesitated when Mac asked for a steam table, then produced a valve catalog that contained one.

Check Size and Velocity

"We can use the old *ABC* formula for the purpose of checking the size and velocity," said Mac. "It's not too accurate, but it's good enough for all practical purposes. Let's see, you say the normal load is 30,000 pounds at 150 psi. What's the specific volume of 150 pound steam? It must be somewhere near three cubic feet, I think."

"That's fairly close, Mac; it is 2.75, to be exact." Paul watched Mac put down the formula: $V = (A \times B \times 2.4)/C$, or $30{,}000 \times 2.75 \times 2.4$. Mac looked up. "What's the area of six inch schedule 40 pipe?" he asked.

Paul looked it up. "28.89 square inches", he said. "Where does that 2.4 come from?"

"The original formula is: $V = (A \times B \times 1728)/(60 \times C \times 12)$; 60 minutes to the hour, and we are working with square feet so that reducing the figures in the formula we get 2.4. Mac took out his little slip stick and murmered, 2.75 × 2.4 is 6.6 times 30,000 divided by 28.89 is about 6850 feet per minute. At 40,000 pounds that would be 9150 feet. Could be higher but it's okay. That low load of 10,000 pounds is bad, however. That's only about 2200 feet. A six inch valve would surely be pounding with that velocity. For your low load, the valve is far too big."

Valve Sized for All Loads?

"It does chatter on the heating load when the sump pump cuts in or the maintenance crew uses steam for some purpose. Makes quite a bit of noise, too. What do we do with that? If the valve is okay for the regular load, shouldn't it be okay for the low load as well?" Paul was genuinely puzzled.

"You might think that it would be, but you must take into account the fact that under low load conditions, the disc is floating on the stream and not held full up in a stationary position as it is under normal or high load conditions. A floating member in a fluid stream will always hunt trying to find a stable situation but seldom finds it. In this case, the disc will be so close to the seat that the slightest variation of load will cause it to bounce and almost surely strike the seat. Once it does that, it acts like a rubber ball that you bounce on the sidewalk. If you don't catch it, the ball will bounce several times. Here the flow tends to keep it going so that the valve is likely to pound itself to pieces in a relatively short time. That's why the manufacturer doesn't want you to use too large a valve." Mac frowned while he talked. Something was wrong here but he could not seem to put his finger on the trouble.

Are Gages O.K.?

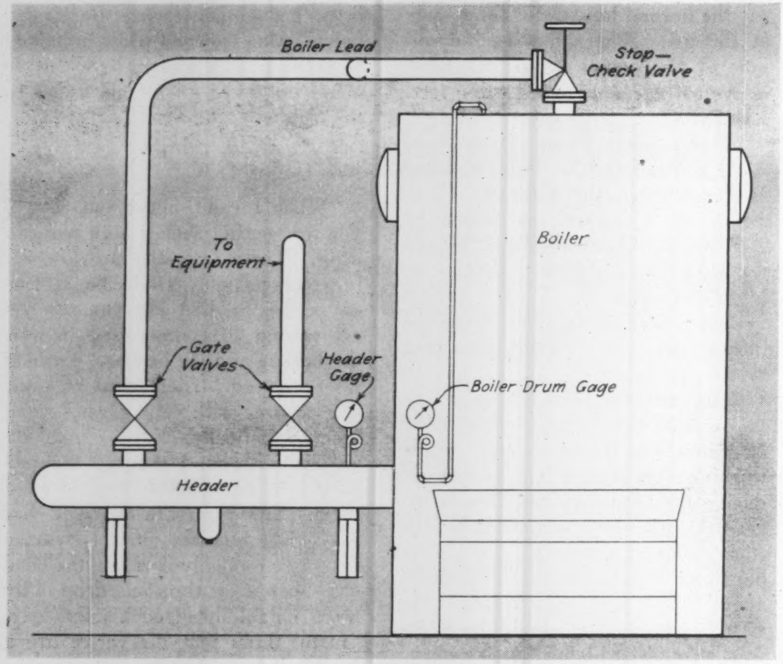
"What I can't figure out is why you are getting such a high pressure drop. These velocities are low and for real economy could be at least 25 percent higher, but you say you are getting 20 pounds drop between the boilers and the header. Frankly, it's cock-eyed. There must be something wrong with your gages," stated Mac emphatically.

"That is what I thought at first," declared Paul, "but I checked all of them. The gages are all right. Last week, just to make sure, I switched the gages on the boilers and the header. They show the same drop either way." Paul shrugged his shoulders. "I still think that the valves are at fault," he said slowly.

"Paul, it doesn't make sense. Are you sure that the handwheels are all the way up on those valves?" Mac started thinking out loud. "If the discs were stuck, they wouldn't chatter under low loads. Both of them would not be stuck in the same way, anyhow. If they were in backwards, they would not open at all and if the stems were not all of the way up, you would know it. Four thousand feet should lift those discs completely. There is something rotten in Denmark, Paul. Let's go down and take a look at the installation." He got up to follow Paul out of the office.

When they got to the boiler room, Mac's eyes quickly took in the piping layout. They walked over to the header which was close to the floor, looking at the gage at about eye level that showed 131 pounds pressure. Turning about, they crossed the room and there on the boiler also at eye level was the gage reading 150 pounds. As they stepped over to the other boiler, Mac's eyes were searching the piping arrangement. This gage also showed 150 pounds pressure. Mac reached up, touched the gage line gingerly and then grasped it firmly. He began to smile and then to grin broadly. "Is this the pressure of the boiler drum, Paul?" he asked. "Do you have another gage up on the drum?"

"No," replied Paul. "When we changed the valves, I put these gages



THE BOILER DRUM GAGE will indicate the true pressure if the line to it is extended to the floor and equipped with a little steam trap

down here so that they would be at eye level and easy to see. When they were up on the drum you had to twist your neck to see them and you were not always sure you were reading them right. Down here they are easy to see and you know just what you are doing."

"Do you?" asked Mac, with more than a trace of sarcasm in his voice.

Paul caught the inflection. "What's the matter with you?" he demanded, searching the grinning countenance.

Water Leg Affects Gage

"Feel this pipe, Paul," suggested Mac, "it's nice and cool. It won't burn your hand, I'm sure." Paul reached up, taking hold of the pipe. The puzzled expression on his face made Mac laugh. "How far is that up to the drum?" he asked, "about 40 feet?"

"Yes, about that," replied Paul. "Why?"

"Each foot of water exerts about 0.433 pounds per square inch, doesn't it, Paul?" inquired the amused gasket salesman.

"Yes — Oh! Oh! I get it. Is my face red? I surely will be in for a razzing when the boss hears about this. Of course, that column of water amounts to 40 times 0.433 — over 17 pounds." He started to laugh. "Am I embarrassed? It never dawned on me that I was adding a long water leg to that gage line. No wonder those valve fellows were puzzled. It kind of had you stumped, too, didn't it Mac?"

"You're darn right it had me stumped. I knew there was something wrong, but I never thought of the gage line. I've been caught that way myself, too. It's one of those things that are so easy to overlook and which can cause so much trouble. Many a piece of equipment has been blamed for poor performance because of a water leg in a gage line." Mac started away from the boilers.

"Wait a minute, Mac. Do I have to put those gages back up there?"

Extend the Line and Trap

"No, I don't think so," replied Mac. "Extend this line to the floor and put a little steam trap on it. That will keep the line free of water and give you a true reading."

"Say, hold on," exclaimed Paul. "If that water has added 17 pounds to the true pressure of the boilers, then the valves are only losing three and a half pounds, and we only have about 135 pounds on the boilers. I'll be darned. No wonder we've had so much trouble with our pressure regulators since we put in those valves." Paul was catching the loose ends fast. "Believe me Mac, we have been getting some crazy results."

"I'm not surprised, Paul," declared Mac. "There is one sign I'd like to hang in a conspicuous place in every plant. *Watch out for water in steam lines and air in water lines. They are dangerous.*" Mac showed how important it seemed to him by his serious tone. "You can see how a little water deceived you, Paul. In a high velocity steam line, or in one where the velocity may change suddenly, a very little water once in rapid motion can do a tremendous amount of damage. I've known a pint of water in the wrong place to wreck a three million dollar turbine."

What About Low Load?

"I knew it could be troublesome, but I wasn't aware that it could be that serious. Tell me now, Mac, what do we do with this low load condition?" Paul still seemed to be puzzled by the stop check valve situation.

"First of all, let's get a few fundamentals straight in our minds." Mac pointed to the valves on top of the boilers. "Regardless of the pressure, it takes a velocity of about 4000 feet to open any kind of stop-check valve completely. The steam has to overcome the weight of the disc and such friction as is developed inside the valve due to the movement of the disc and the cushioning that has been provided to prevent the disc from slamming against the top of the valve. In this type of valve, you will find that care has been taken to relieve the static pressure that builds up above the disc until the disc gets high enough to make the cushion effective. If for any reason this static pressure above the disc is not relieved, the valve will refuse to function."

Mac paused for a moment. "My first suspicion of your valves was that this had occurred. It could have produced the excessive pressure drop, but then you would have been complaining of restricted steam delivery. That static pressure being higher than the pressure of the flowing steam can cause the valve, which is essentially a simple lift check valve, to almost close. Under such conditions, it will find a balanced disc position that will restrict the flow to as low as 25 percent of full flow. That's why I passed that up as the probable trouble here." Mac used his hands freely to illustrate his remarks.

"I suppose it takes a lot of experience to learn all those little details," remarked Paul. "It's funny how much more you have to learn every day."

"Never get through learning, Paul. When you do, you start to die," laughed Mac. "Now, in the second place, you must remember that every automatic valve has one point at which it can do its best work. Incidently, that goes for gates and globes, too. An automatic valve like a check valve has not only an ideal point of operation, but it also has definite limits as far as its ability to perform. These stop-check valves just won't work with the disc in too low a position. So when your range of demand is beyond the limits of the particular valve you are using, you must provide some other way to take care of the unusual situation. In this case, it's the low load."

"Suppose you suggest a way of doing it," said Paul, not unkindly.

Install Smaller Valves

"I'd cut into those steam leads from the boilers ahead of the six inch stop-checks and put in a connection with a smaller valve on each boiler, say a three inch. Then you can run the stem down on the large valves and have a perfectly operating stop-check on your low loads. That would eliminate the chance of the larger valves pounding themselves to pieces. Close the small valves when you're running full." Mac started to stroll toward the door. "Paul, to insure the safety that these valves are supposed to provide, they must close tightly whenever they are called upon to close automatically. They better be drop tight too, whenever the boiler inspector takes a notion to test your boilers. Pipe both small valves into a single line to the heating header and save from keeping the plant under pressure when you are not working."

"Mac, your visit has been worth a lot to me. You caught a bad error. While it embarrasses me, the valve people have you to thank for solving what was really an unjustified complaint."

"You don't owe me anything, Paul. It's a pleasure to be able to help. Then, too, I learn a few things myself in working on such problems. Good by and good luck," said Mac.

Air Conditioning Aids Food Industry's Progress

. . . new agricultural era

PROBABLY THE greatest and most interesting developments in the food industry are in the growing and producing portions of the field, said Arthur J. Hess, president of the American Society of Refrigerating Engineers, at an educational conference sponsored by the Air-Conditioning and Refrigeration Institute. For many centuries there were practically no developments in the agricultural industry and even in the last half-century almost the only developments were in farm machinery, planting and cultivating methods, developing of fertilizers and some plant breeding, he stated. Now we come into a new agricultural era participated in by the air conditioning industry.

We are now studying plants and animals under controlled environments to find proper growing conditions and set up "comfort charts," he said. Control of environment includes air conditioning. Around the world there are now a number of plant growing research laboratories in which all environmental conditions can be controlled and many more will be constructed in the next decade.

While the air conditioning industry will participate in the design and construction of plant growing laboratories, we will find a greater commercial outlet in the great luxury food and seed growing greenhouses that will result from this research, for it is only by means of air conditioned space that we can truly control breeding of species and prevent the inroads of strange pollens, he said. Animal husbandry work at a few pilot laboratories is also of great interest in the near future.

Animal environment laboratories have established the fact that efficiency of animals varies with the environment, a fact suspected from our knowledge of humans, who are also animals. Hogs, for example, grow faster and larger in environments around 70 deg and normal humidities, with a falling efficiency curve as the temperature rises to above 90 deg, where bare existence is possible, and at 100 F for any length of time, death results, he stated. The question is not being studied to "coddle" the animals but purely from the economic standpoint — in other words, more hog meat for less food money. This will mean that there will be some form of cooling used by most hog growers.

Dairy animals are also under investigation, and it has been determined that these animals keep themselves warm with additional food over and above the amount they consume at normal temperatures in their comfort range. The extra amount of food becomes enormous at low temperatures, he said. Some form of heating and ventilating is the answer — again, the justification is economic. Poultry raisers can also economically justify air conditioning.

Another important part of the study of growing plants has to do with the study of photosynthesis. Photosynthesis is the method used by plants to absorb energy from the sun. Utilization of the energy from the sun, which reaches the earth in enormous quantities, is an obvious answer to the fuel problem and research has been undertaken to find ways and means of doing this. Plants, while not too efficient, by means of photosynthesis do absorb energy from the sun and lock it into the plant where the energy can be recovered by combustion or conversion to a chemical form of energy such as alcohol. These studies of plant growing can increase the efficiency of photosynthesis by determining proper growing locale and by proper specie breeding and other factors, Mr. Hess said.

Choose Your Words Carefully

WILLIAM HURD HILLYER, author of this regular feature, is a contributor to a number of banking and financial publications and has written several books on business. A former vice president of the Atlanta Trust Co., his work there gave him a practical legal background.

AS OFTEN SHOWN on this page, legal phrases are full of pitfalls and this fact should be realized by all. However, common words may also prove dangerous. Surely the heating contractor in the case described herein never dreamed that the word "new" would prove so costly.

Heatem Corp. [all names are fictitious] contracted with Parr-Ticula & Associates to install a new oil burner and a new tank on their premises. The agreement was signed in July, and the installation was completed in September. Since the contract embodied a one year guarantee, Parr-Ticula telephoned Heatem 14 months later to state that the oil burner had gone dead although the tank had been filled only 48 hr previously. Heatem paid no attention to the complaint, so Parr-Ticula called the oil merchant who came and found the tank empty.

Parr-Ticula's phone call, which hinted of a leak and asked Heatem to look at the tank, proved to be futile, as was a personal call at the heating corporation's office. Heatem averred that the 12 month guarantee had expired some weeks before.

The Associates arranged for another firm to install a new tank, having made a final telephone demand upon Heatem and having been turned down again. When the tank was raised, "two or three very porous spots through which the oil had leaked" were discovered and the ground around the tank was "oil-soaked." Patience exhausted, Parr-Ticula sued Heatem for damages and breach of contract.

Heatem's main defense was the alleged expiration of the guarantee period. At the trial, he admitted that he had agreed to install a "new tank." He contended that the tank he furnished had passed all official inspections and had never been used. The trial judge found "as a fact" that the tank was defective when installed and that this condition "must have had its origin some three years before." Judgment was entered against the heating corporation and in Parr-Ticula's favor.

Appealing to the appellate division of the superior court, Heatem contended that the trial judge unfairly permitted Parr-Ticula's star witness "to testify as to hypothetical questions and technical data outside the scope of his qualifications." The witness had said that he pushed his finger through certain spots although he found the tank's exterior "in fairly good condition." He concluded that "there was evidence of corrosion."

As for the contract, Heatem urged that the guaranty upon which Parr-Ticula sued extended for only one year after the tank's installation. Under the "Guarantees, Terms and Conditions" Heatem had agreed to make good at his place of business, any part or parts of the installation—electric motors and windings subject to manufacturer's guarantee—provided such part or parts be returned to him, transportation prepaid, within a year after installing. It was further provided that replacement should be made only if Heatem "upon examining them to his own satisfaction, should deem them defective."

Heatem leaned heavily upon this clause, which he viewed as protecting him against any liability regarding the tank. The appeals court thought otherwise. Conceding that the agreement was susceptible to two constructions, the presiding judge divided the clause into two parts: (1) a general warranty not limited to a one year period, and (2) an agreement that Heatem Corp. will make good any parts returned to it within one year. "The limitation period", said the court, "does not cut down the general warranty found at the beginning of the sentence."

The judge dwelt long and learnedly upon the legal pros and cons of the contract's interpretation. What finally tipped the scales against Heatem and in favor of Parr-Ticula was the heating company's admitted representation that it was selling and installing a "new" tank. "Whereas", said the court, "proofs definitely established that the tank was not a new one, but that rust had long since begun to deteriorate the 3/16 in. metal shell." True, "the tank may never have been *used* in a prior installation, but it was not 'new' in the sense that it was of *recent fabrication*, relatively *fresh from the fabricator*" and from "*plant inspection* which would insure its fitness and soundness for installation and use". The fact that it passed examination by an inspector of the municipal bureau "means little. He looked at the outside of the tank, but made no inspection of the inside".

The higher tribunal, therefore, in its decision affirming the lower court's judgment against the heating corporation, distinctly concluded that "plaintiff was entitled to recover for damages flowing from defendant's failure to install a *new* tank." Had the contract described the tank as *unused*, Heatem might have fared better.

[Note: While this discussion applies to an actual case, it should be remembered that legal rules vary in different states.]

QUESTION OF THE MONTH

What's the Right Heating Design Condition for Classrooms?

• *IF YOU DON'T HAVE the answer to a heating, piping or air conditioning problem, chances are someone else does — or can be helpful on part of it. That's the reason for HPAC's Question of the Month "idea exchange."*

• *YOU ARE INVITED to contribute a question for publication, or an answer to a published question. Please address your reply to the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*

• *IN A QUESTION published in the April HPAC, R. W. McKinley brought up the matter of design conditions for school classrooms, which another reader comments on here . . .*

In his question about school heating design conditions, published in the April HPAC, R. W. McKinley raised so many points that it would take a long article to answer them completely. I will concentrate on one: " . . . what ranges of temperature, relative humidity, degree of radiant energy (sic) and air velocity will be most beneficial to the educational processes typical of contemporary classrooms . . ?"

A good many years back, experiments by the New York State Commission on Ventilation showed surprisingly large variations in educational achievement with variations in temperature. In these experiments, it was found that the average score of pupils taking a typewriting test increased considerably when the temperature was dropped to 68 F (at a relative humidity of 50 percent), whereas the average score in mental multiplication rose with the temperature up to 75 F (relative humidity 50 percent). [See *Temperature and Human Life*, Winslow and Herrington. (Princeton), page 178.]

This accords, theoretically, with ASHVE data giving the metabolic rate for rapid typewriting (in adults) as 558 Btu per hr, and the rate for persons "seated, at rest" as 384 Btu per hr. [See ASHVE *Guide*, 1944, page 52.] Obviously, such large differences in bodily heat production call for a considerable adjustment in thermal conditions for maximum performance. This principle is recognized in the regulations of the New York State Commissioner of Education, which call for a minimum temperature in classrooms of 70, in corridors, shops, etc., of 68, and in gymnasiums of 65. [See *Heating and Ventilating Recommendations for New York State Schools*, 1950, page 41.]

However, few classroom activities, even in the elementary grades, involve physical activity as intense and prolonged as a typewriting test. Moreover, when such activity is fairly intense, it normally involves spatial movement which has the effect of increasing the rate of air flow over the body and is thus partially compensated for by increased heat loss. It can therefore be assumed that the optimum range for classroom temperatures is from about 71 to 75 F, with the lower figure corresponding to educational processes involving greater physical activity (as in the lower grades) and the upper figure to those processes involving greater mental activity (upper grades). Temperatures below these levels are likely to produce restlessness in the pupils, as they move about and squirm in an unconscious effort to increase bodily heat production, and temperatures above the level appropriate to the permitted degree of activity are likely to produce lassitude and inattention.

More recent data of the type used to promote acceptance of air conditioning in banks, offices, etc., have left little doubt that there is an intimate relationship between the efficiency with which various mental and clerical activities similar to schoolwork are carried out and the optimum temperature for the activity. Many teachers are aware of this relationship. In one striking instance from my own experience, a teacher using a west-facing Baltimore classroom with a big afternoon solar gain, and no means for cooling the room except opening the windows, volunteered the statement, "Any teaching done in this room has to be done in the morning," adding, "I have a hard time keeping up with the curriculum."

Actually to maintain such optimum temperatures in modern classrooms, with their architectural emphasis on daylighting, requires a surprising amount of cooling with outdoor air, even in very cold weather. In the course of research at the "Laboratory School" in Moline, Ill., it was found that north, south, east and west classrooms all required heating, on fairly clear days, for only a short time in the early morning, and thereafter required varying amounts of cooling (by controlled ventilation) to hold temperatures between 71 and 74 F — the south and west rooms needing cooling even in sunny zero weather. Air movement in these rooms was held below 25 fpm in the occupied portion, and when it was not — as when the window downdraft was not controlled — complaints of "draftiness" resulted. Relative humidity ranged between 18 and 42 percent — or just below the level where condensation might have appeared on the windows — and there was no evidence of subjective awareness of this variation. Mean radiant temperatures, which were recorded continuously in classrooms facing in the four directions, tended to stay within a degree or two of the air temperature despite the presence of large, cold glass surfaces, owing to diffuse radiation entering the windows, and were sometimes as much as 6 or 7 deg above the ambient temperature when a good deal of direct sunshine was coming into the rooms.

Ideally speaking, it is possible that the educational efficiency of these rooms might have been increased by lowering the air temperature a few degrees during such periods of maximum insolation, and also by small temperature adjustments corresponding to the physical activity or inactivity of the pupils. However, since it is also possible to gear a learning program to familiar and expected changes in the thermal environment, provided they are not too great, this may be unnecessary. At the laboratory school, the teachers had an observable tendency to shift activities out of the sunlit portions of the rooms, exemplifying the latter type of adjustment.

Thus, maintenance of optimum learning conditions from the thermal standpoint is practical so long as outdoor air low enough in temperature is available to do the needed cooling job, and equipment provided to introduce such air without creating drafts. Under such conditions, relative humidity is not a consequential thermal factor and variations in radiant temperature may, if necessary, easily be compensated by small adjustments in the air temperature. Once the outdoor temperature rises above 55 or 60 deg, however, the problem changes. It becomes necessary to rely on window ventilation to cool the room, and eventually, as outdoor temperatures go higher, it is no longer a matter of maintaining optimum conditions but conditions which are barely tolerable.

The educational field has long been aware of the fact that in non-air conditioned schools the learning process slows down as the temperature rises in spring, reaching a point of diminishing returns where it is scarcely worth continuing sometime in June, depending on the climate. It is highly probable that this point is reached a good deal earlier in the year in many classrooms being built today, where emphasis on lighting has resulted in inordinately high electric light and solar heat gains without compensating ventilation — just as it was reached in mid-winter in the instance of the Baltimore classroom already mentioned.

If the upper limit of tolerable thermal conditions for classroom activities not involving physical exertion is taken as the 71 deg effective temperature point at which most office workers declare themselves to be "hot," this limit is reached whenever the *globe thermometer*, or black body resultant temperature of a classroom goes over 79 deg, due to a rise either in the ambient *or radiant* temperature, with minimal air movement and a relative humidity of 50 percent. With air movement of 100 fpm, the limiting *resultant* temperature would be 81 deg at 50 percent relative humidity, about 80 at 60 percent, and about 85 for those lucky enough to enjoy the low relative humidity of the arid Southwest, assuming fairly rapid air movement.

These figures correspond with everyday experience with ordinary air temperatures in rooms in which the radiant temperature does not ordinarily rise above the air temperature. In modern classrooms, however, it is essential to use the resultant temperature as measured with a globe thermometer as the index, since the combination of dense occupancy, high intensity electric lighting and/or solar radiation in such rooms pushes the radiant temperature well above the temperature of the air during critically hot periods.

Not too much is known about warm weather resultant temperatures in modern classrooms because they have not yet been systematically measured. From what has been learned of winter conditions, however, it seems more than likely that our present-day classrooms must become too hot a good deal earlier in the year than the kind of rooms most of us are accustomed to, and that this must be having a serious inhibitory effect on the educational process (as a matter of fact, educationalists are beginning to complain of it). At the very least, this points to a need for much more lavish and positive warm-weather ventilation of school classrooms, and at the most, to a need for refrigeration cooling — plus the architectural redesign of such rooms it would probably necessitate. — Henry Wright, Technical Consultant, Herman Nelson Unit Ventilator Div., American Air Filter Co. Inc.

READER ASKS —

"Do Outdoor Heaters, Snow Melting Attract Interest in Store Windows?"

"I understand that there are outdoor installations of overhead radiant heaters — particularly abroad — above show windows of stores to make it more comfortable in the winter so that passersby will stop and look at the show windows. I believe such installations have usually been electric, but I wonder if anyone has given consideration to other heating methods?

"It is also my understanding that sidewalk snow melting is another means of inviting attention to a store's show windows in the winter, making it pleasant to pause for a few minutes.

"I'd be interested in learning from other of HPAC's readers of installations of this kind — particularly if they have proved of value in promoting interest in a store's show windows." — C.R.

[*You are invited to comment on this question, giving actual examples if possible. Address the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2*].

Expect Electric Power Use To Double

. . . '58 compared to '50

A doubled use of electrical power in 1958, as compared with 1950, was predicted by speakers at last month's 20th annual sales conference of the Edison Electric Institute.

An even sharper increase in use of electricity in homes because of air conditioning and TV is also foreseen.

An annual growth rate of the utility industry of 7.4 percent, compared with a 3.4 percent annual increase in the national economy is expected.

Heating, Piping & Air Conditioning

THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

JOURNAL SECTION

The object of the Society is to advance the arts and sciences of heating, ventilating, cooling and air conditioning, and the allied arts and sciences, for the benefit of the general public, to encourage and conduct scientific research, and to cooperate with other organizations having the same or similar objectives.

Computing Temperatures and Velocities in Vertical Jets of Hot or Cold Air

By Alfred Koestel*, Cleveland, Ohio

This paper is the result of research sponsored by THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS in cooperation with Case Institute of Technology, Cleveland, Ohio

SUMMARY — Equations are given in this paper to provide a basis for exploring the performance of all non-isothermal heated or cooled air jets discharging vertically into undisturbed space either upward or downward. Approximate values of the constants in these equations as given are based on theory and available experimental data.

While the derived equations are not to be considered exact until verified experimentally, they are recommended for engineering use pending their refinement by more rigorous experimental work.

KNOWLEDGE OF THE behavior of free air jets is at present sufficiently developed so that an attempt can be made to formulate equations which describe the performance of non-isothermal jets. Jet performance from the engineering viewpoint can be defined by maximum centerline velocity variation with distance, together with cross-sectional patterns of velocity and temperature. For non-isothermal jets the temperature-difference variation between the jet and the ambient air is of importance.

The overall treatment of the non-isothermal jet is macroscopic in nature in that the internal mechanisms of fluid flow and heat transfer are not considered. The jet performance is analyzed in terms of principles involving conservation of thermal energy and the equating of the buoyant forces to the change in jet momentum. The differences in rates of momentum transfer and heat diffusion are taken into account by the use of an overall effective turbulent Prandtl number.

Although the values of some of the constants of integration cannot be accurately substantiated, sufficient experimental data are on hand so that approximate values can be established. It is hoped that the equations presented here will contribute to the guidance of any future laboratory investigations of non-isothermal jet performance. The detailed mathematical analyses will appear in the Appendix which will be published with the paper in the TRANSACTIONS.

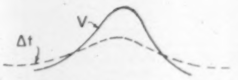


Fig. 1—Cross-sectional profile of velocity and temperature difference for a non-isothermal jet

Non-Isothermal Free Jets

Flow of non-isothermal air from a nozzle into a free space will have the following notable features:

1. A velocity profile and a temperature-difference profile which have shapes that

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*Assistant Professor of Mechanical Engineering, Case Institute of Technology. Member of ASHVE.

For presentation at the Semi-Annual Meeting of THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, Swampscott, Mass., June 1954.

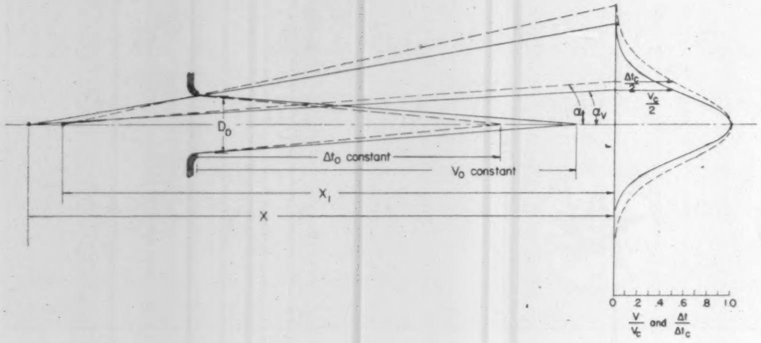

Fig. 2—Diagram of a non-isothermal jet near the outlet, showing zones of constant velocity and constant temperature

can be approximated by an error function type curve (normal probability curve) (see Fig. 1). The temperature-difference profile is flatter than the velocity profile because heat diffuses more rapidly than momentum.

2. A zone exists near the outlet in which the temperature-difference and the velocity measured along the nozzle axis are approximately constant and equal to those existing at the outlet (see Fig. 2). This zone is in turn followed by another in which transition takes place from the flow characteristics of a confined fluid to that of a free jet.

3. The free-jet zone, in which the jet is fully developed, is the major zone of the jet.

Method of Analysis

Under isothermal conditions it has been found that the conservation of momentum principle can be applied in the analysis of a free jet since no external forces are assumed to act on the free jet stream. Equations of the form

$$V_c/V_o = \frac{K}{(X_o/D_o)} \quad \text{------------------}(1)$$

and

$$V_c/V_o = \frac{K+A}{(X_o/D_o)+A} = \frac{K_p}{X/D_o} \quad \text{-------}(2)$$

have been determined from test (see Fig. 3). A is the distance in diameters from the outlet face to an imaginary point source behind the outlet as shown in Fig. 3. Values from 0 to 3 have been reported for A. Equations 1 and 2 are identical when A is zero and K_p becomes equal to K. A can be determined experimentally either by plotting the reciprocal of V_c *vs.* X for the major free-jet zone and extrapolating the curve to zero, or by extension of the angle of expansion to its intersection with the centerline of the nozzle. Equations 1 and 2 apply to the jet flow at distances outside of the constant velocity core. When V_c/V_o equals unity in Equations 1 and 2, $K = (X/D_o)$ and $K_p = (X/D_o) + A$. The constant K, therefore represents the apparent length of the constant velocity zone measured from the nozzle, (as determined by the point of intersection Q, Fig. 3) and K_p is the length of the constant velocity zone measured from the point source. K_p is therefore equal to $K + A$. The constants K_p and K have been verified experimentally by Tuve[1] and others and have been found to vary somewhat with outlet velocity, the percentage free area of the outlet, (if covered with a grid type lattice) the type of approach to the outlet, and the amount of turbulence induced behind the outlet. For outlet velocities above 1000 fpm a value for K of 6.5 is representative of many tests on nozzles. Differences between the jet density and the density of the receiving medium also affect the core length as shown in Fig. 4.

Simplifying Assumptions

For vertically projected non-isothermal free air jets an equation similar to Equation 2 can be formulated if the following assumptions are made:

1. The absolute value of the air density is constant throughout the jet, but the differences in density are taken into account when the buoyant forces are considered. This assumption is valid if the temperature differences between the jet and the surroundings are not too great. Temperature differences normally involved in the appli-

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[1] Exponent numerals refer to References.

Nomenclature

A = distance from outlet face to the apparent point source, in diameters. See Fig. 3.
a = shape factor for the velocity profile.
b = shape factor for the temperature difference profile.
C_2 = constant of integration.
D_o = outlet diameter, feet.
g = acceleration due to gravity, feet per (second) (second)
K = distance from nozzle to the termination of the apparent constant velocity core, in diameters. K is the familiar constant of proportionality for air jets[1].
K_p = distance from apparent point source to the termination of the apparent constant velocity core for an isothermal jet, in diameters. ($K_p = K + A$).
$K_{p,n}$ = distance from apparent point source to the termination of the apparent constant velocity core for a non-isothermal jet, in diameters.
N_{Prt} = overall effective turbulent Prandtl number of the non-isothermal jet.
Q_x = heat flow of the jet at distance X measured above ambient temperature, Btu per second.
r = radial distance from centerline axis, feet.
R = $K_{p,n}/K_p$ (see Fig 4).
Δt_c = maximum centerline temperature difference at distance X, Fahrenheit degrees.
Δt_o = temperature difference at the outlet, Fahrenheit degrees.
$(\Delta t_c/\Delta t_o)K_p$ = temperature difference ratio evaluated at the termination of the apparent constant velocity core at K_p.
V_c = maximum centerline velocity at distance X, feet per second.
V_o = outlet velocity, feet per second.
V = velocity at r, feet per second.
X = distance from the apparent point source based on the velocity profile, feet.
X_1 = distance from the apparent point source based on the temperature difference profile, feet.
X_o = distance measured from the outlet face, feet.
X_{max} = distance to where V_c is equal to zero measured from the apparent point source, feet.
$X_o(max)$ = distance to where V_c is equal to zero measured from the outlet face, feet.
a_t = angle of expansion for the temperature difference profile, degrees.
a_v = angle of expansion for the velocity profile, degrees.
β = coefficient of expansion. For a perfect gas $\beta = 1/T$, where T is the temperature of the ambient air, Fahrenheit absolute.

cation of jets to space heating or cooling can be considered not too great.

2. The velocity and temperature difference profiles in the fully developed region of the jet can be represented by an error function type curve or normal probability curve.

3. The difference between the temperature-difference profiles and velocity profiles at a given section of the jet is due to the difference between heat and momentum diffusion in a turbulent jet. This difference in diffusion rate can be expressed by the use of an overall effective turbulent Prandtl number.

4. The angles of expansion for the temperature difference and velocity profiles are constant but differ in value due to the difference in heat and momentum diffusion, or in other words, due to the effective turbulent Prandtl number of the non-isothermal jet.

5. The velocity and temperature difference profiles remain symmetrical about a centerline through the outlet.

6. Thermal energy, Q_x, (or enthalpy flow) is conserved in the axial direction. For heated air projected downward and chilled air projected upward a point in the jet may be reached where the jet momentum in the axial direction is reduced to zero by the buoyant forces; and as a result the heat flows radially outward from the jet (see Fig. 5). In this region the assumption that Q_x is a constant and that the velocity and temperature profiles remain symmetrical is not valid.

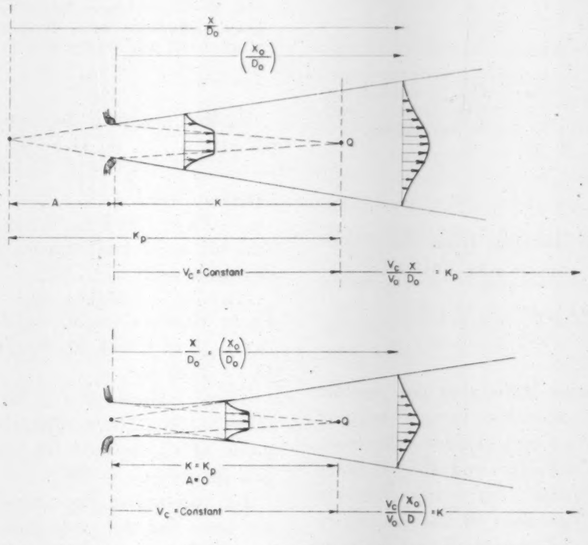

$\frac{X}{D_o}$
$\left(\frac{X_o}{D_o}\right)$
Q
A
K
K_p
V_c = Constant
$\frac{V_c}{V_o}\frac{X}{D_o} = K_p$
$\frac{X}{D_o} = \left(\frac{X_o}{D_o}\right)$
Q
$K = K_p$
$A = 0$
V_c = Constant
$\frac{V_c}{V_o}\left(\frac{X_o}{D}\right) = K$

Fig. 3—Characteristics of an isothermal jet as defined by Equations 1 and 2.

Basic Equations

From the analysis based on the simplifying assumptions already stated, the following expression for the centerline velocity variation with distance from the apparent point source is derived as the equation:

$$(V_c/V_o)^3 = \left(\frac{K_p}{X/D_o}\right)^3 \pm \frac{3}{8}C_2\left(\frac{a}{b}+1\right)\left(\frac{D_o \Delta t_o \beta g}{V_o^2}\right)\frac{1}{X/D_o} \quad \text{(3)}$$

The ratio a/b is a function of the overall effective turbulent Prandtl number of the jet as defined by the equation:

$$b/a = \{4/[1 + (1N_{Prt})]\} - 1$$

A Prandtl number of 0.7 has been suggested for non-isothermal jets by such experimenters as Nottage[3], Forstall and Shapiro[4], and Corrsin and Uberoi[5].

For heated jets projected downward and for chilled jets projected upward, the sign is minus in Equation 3; and for heated jets projected upward and chilled jets projected downward the sign is plus. Equation 3 is also applicable for isothermal jets, for when $\triangle t_o$ is zero we have Equation 2. The dimensionless parameter $D_o \triangle t_o \beta g / V_o^2$ represents the ratio of the buoyant force to the momentum force evaluated at the outlet.

Available test data show a value of 6.5 to 9.5 for K_p, *the apparent* length of the constant-velocity core as determined by the intersection Q, Fig. 3. By considering the conditions at this point Q, *i.e.*, the apparent termination of the constant velocity core, the constant of integration C_2 can be evaluated. For isothermal jets C_2 is theoretically equal to $2K^2$. This can be shown as follows:

For isothermal jets Equation 4, was derived and is,

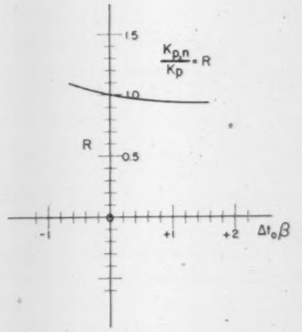
$$V_c/V_o = \sqrt{\frac{C_2}{2}\frac{D_o}{X}} \quad \text{(4)}$$

when
$V_c/V_o = 1$, $X/D_o = K_p$ and Equation 4 becomes,

$$1 = \sqrt{\frac{C_2}{2}\frac{1}{K_p}}$$

and
$C_2 = 2K_p^2$.

From the analysis based on the simplifying assumptions the following equation involving the centerline temperature difference, centerline ve-



(Computed from data reported by Eck[2])

Fig. 4—Effect of air density on the length of the constant-velocity core, measured from the point source

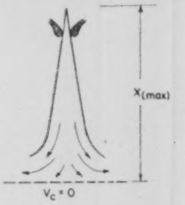


Fig. 5—Radial outflow from a non-isothermal jet

locity, and distance from the apparent point source was derived,

$$\frac{C_2(1+b/a)}{4}=\left(\frac{\Delta t_c}{\Delta t_o}\right)\left(\frac{V_c}{V_o}\right)\left(\frac{X}{D_o}\right)^2 \quad (5)$$

This equation states that the product of the dimensionless factors defining the centerline temperature difference, centerline velocity and the distance from the point source squared is a constant regardless of the trajectory of the jet. Equation 5 can be used for arriving at a value for C_2 by substituting test data for any non-isothermal jet.

When $X/D_o = K_p$ in Equation 5, $V_c/V_o = 1$ and for N_{Prt} of 0.7,

$$C_2 = 2.43\ (\Delta t_c/\Delta t_o)_{Kp}\ K_p^2.$$

From Corrsin and Uberoi data shown in Fig. 6 $(\Delta t_c/\Delta t_o)_{Kp}$ is 0.75 when $X/D_o = K_p$. Therefore, $C_2 = 2.43 \times 0.75\ K_p^2 = 1.82\ K_p^2$.

Data obtained by Nottage on a chilled jet with a $\Delta t_o = 39$ F deg and a $V_o = 500$ fpm show a $(\Delta t_c/\Delta t_o)_{Kp} = 0.70$ (approximately) at K_p. Therefore, $C_2 = 2.43 \times 0.70\ K_p^2 = 1.7\ K_p^2$.

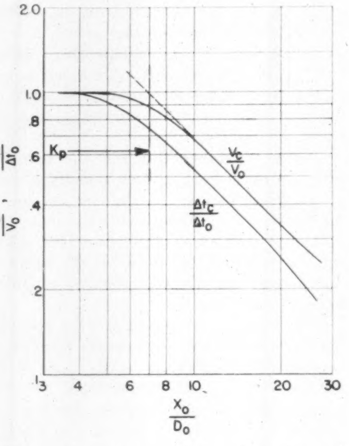


Fig. 6—Centerline velocity and temperature difference as a function of distance from the outlet for a horizontal jet

(From data reported by Corrsin and Uberoi[5])

Ruden[6] obtained data on a heated jet with a $\Delta t_o = 31$ F deg (2.83 in. round nozzle). His axial velocity equation was,

$$V_c/V_o = 6.45/[(X_o/D_o) + 0.66]$$

and his axial temperature difference equation was,

$$\Delta t_c/\Delta t_o = 5.86/[(X_o/D_o) + 1.41]$$

From Ruden's equations the $(\Delta t_c/\Delta t_o)_{Kp} = 0.814$ at K_p; therefore, $C_2 = 1.98\ K_p^2$.

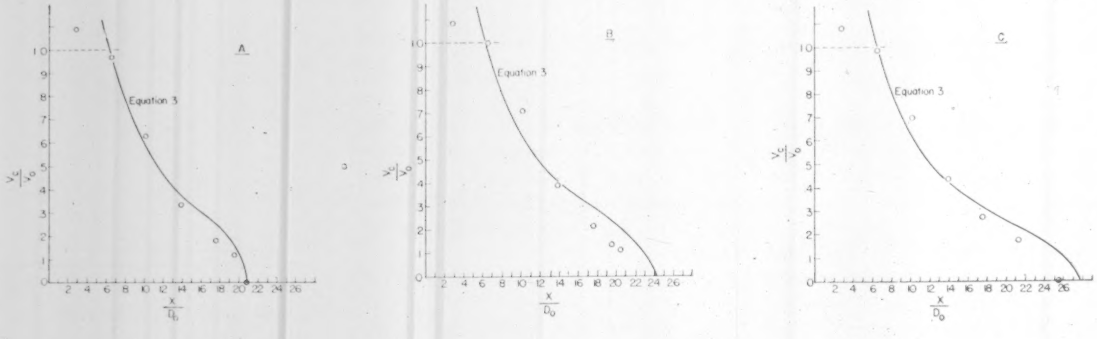
These values of C_2 for non-isothermal jets are comparable to the value of C_2 derived for the isothermal jet, *i.e.*, $C_2 = 2K_p^2$.

By combining Equations 5 and 3 we have for the centerline temperature difference as a function of distance,

$$\Delta t_c/\Delta t_o=\frac{\dfrac{C_2(1+b/a)}{4K_p\cdot X/D_o}}{\left[1\pm\frac{3}{8}\dfrac{C_2(a/b+1)}{K_p^3}\dfrac{D_o\Delta t_o\beta g}{V_o^2}\left(\dfrac{X}{D_o}\right)^2\right]^{\frac{1}{3}}} \quad (6)$$

Equations 5 and 6 do not apply in such a terminal region of a jet where the heat flows radially outward as the velocities in the x direction are reduced to zero (*i.e.*, heated air projected downward and chilled air projected upward) (see Fig. 5). In this region Equations 5 and 6 give increasing values for $\Delta t_c/\Delta t_o$ with an increase in X/D_o which is, of course, not possible.

Further equations, for determining the velocity and temperature envelopes, are derived in the Appendix. These envelopes are defined as the loci of all points of equal velocity or equal temperature-difference, thereby defining the shape of the stream.



TEST DATA

Curve No	$\frac{V_o^2}{D_o \Delta t_o \beta g}$	Δt_o (°F)	V_o (fps)	t_a (°F)	Common to all
A	125	99	20.1	76	Downward projected heated air $D_o = 6\frac{1}{2}$" nozzle
B	172	94	23	73	
C	228	112	28.6	86	

Fig. 7—Comparison of Equation 3 with experimental results by Helander[7]

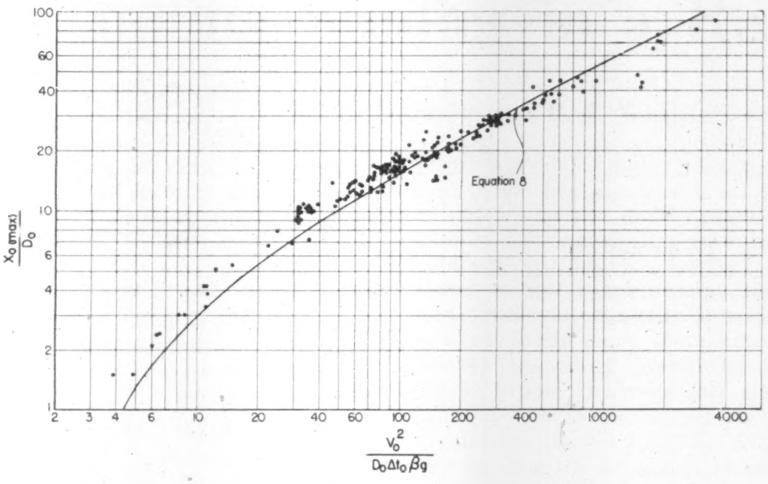


Fig. 8—Comparison of Equation 8 with test points by Helander[7] for maximum travel of jet

Comparison with Test Data

In Fig. 7, Equation 3 is compared with test data on heated air projected downward. The distance from the outlet face to the apparent point source was assumed as 2.85 diameters for the test points and the value for the overall effective turbulent Prandtl number was taken as 0.7. For a C_2 equal to $2K_p^2$, the agreement between equation and test data is good when a value of K_p equal to 6.5 is used. A value of K_p equal to 6.5 in conjunction with an A of 2.85 is somewhat lower than anticipated.

Equation 3 indicates that for chilled jets projected upward and heated jets projected downward, the conditions for which the sign is minus, there is a distance X/D_o for which V_c/V_o becomes zero. This distance, termed *maximum downward blow*, for heated jets has been reported by Helander[7], who has obtained extensive data on this boundary condition. When $V_c/V_o = 0$, $X/D_o = X_{max}/D_o$ and Equation 3 becomes,

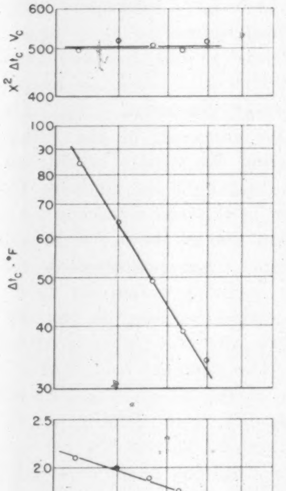
$$\frac{8\left(\frac{V_o^2}{D_o \Delta t_o \beta g}\right) K_p^3}{3C_2(a/b+1)} = \left(\frac{X_{max}}{D_o}\right)^2 \text{- - - - - - - - -} (7)$$

If the same values for A, N_{Prt}, C_2 and K_p are assumed as in Fig. 7, we have,

$$3.4\left(\frac{V_o^2}{D_o \Delta t_o \beta g}\right) = \left[\left(\frac{X_{o(max)}}{D_o}\right) + 2.85\right]^2 \text{- - -} (8)$$

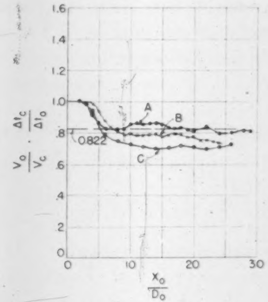
This equation is compared with Helander's test data in Fig. 8.

In Fig. 9 data obtained by Schmidt[8] are plotted on an upward projected heated jet produced by natural convection. For this jet the centerline velocity varies as $X^{-1/3}$ and the centerline temperature difference as $X^{-5/3}$. Equation 3 would indicate this one-third slope when the term on the right side of the plus or minus sign is large compared to the left hand term. The product $(\triangle t_c V_c X^2)$ computed from Schmidt's data is also plotted in Fig. 9. Note that the product is relatively constant and independent of distance X, as pointed out by Equation 4.



(From data reported by Schmidt[8])

Fig. 9—Characteristics of a heated jet in natural convection $D_o = 2.17$ in., $A = 2.0$ diameters



Note: D_o = 1-in. round nozzle.
Curve A is for $\triangle t_o$ = 540 F deg.
Curve B is for $\triangle t_o$ = 27 F deg.
Curve C is for $\triangle t_o$ = 306 F deg.

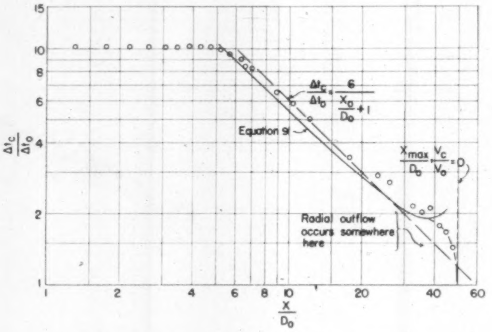
Fig. 10—The product (V_o/V_c) $(\triangle t_c/\triangle t_o)$ *vs.* distance from outlet as shown by data of Corrsin and Uberoi[5].

For horizontally projected nonisothermal jets for which the trajectory is reasonably horizontal, the ratio of momentum to heat flow should be a constant. Under these conditions Equation 28 in the Appendix was derived. This equation is (V_o/V_c) $(\triangle t_c/\triangle t_o) = \frac{1}{2}(1 + b/a)$. When N_{Prt} is taken as 0.7, (V_o/V_c) $(\triangle t_c/\triangle t_o) = 0.822$. The value 0.822 is compared with the product, (V_o/V_c) $(\triangle t_c/\triangle t_o)$, computed from test data obtained by Corrsin and Uberoi in Fig. 10.

According to Helander's unpublished results (Progress Report, Downward Projection of Heated Air January 6, 1951) an equation of the form

$$\triangle t_c/\triangle t_o = 6/[(X_o/D_o) + 1]$$

roughly correlated his data on centerline temperature differences for



For value of $D_o \triangle t \beta_g / V_o^2 = 0.00137$

Fig. 11—Comparison of Equation 9 with centerline temperature differences obtained by Helander[7]

values of

$$[D_o \triangle t_o \beta g / V_o^2]$$

ranging from 0.0024 to 0.0013. Note that the distance from the nozzle face to the apparent point source for this temperature difference equation is estimated as unity. Equation 6 is plotted (also see equation 9) in Fig. 11 for a

$$[D_o \triangle t_o \beta g / V_o^2]$$

equal to 0.001370 and compared with corresponding test data. The same values for N_{Prt}, C_2, and K_p are assumed as in Fig. 7 for which Equation 6 becomes,

$$\Delta t_c / \Delta t_o = \frac{\frac{5.35}{X/D_o}}{\left[1 \pm 0.294 \left(\frac{D_o \Delta t_o \beta g}{V_o^2}\right)\left(\frac{X}{D_o}\right)^2\right]^{\frac{1}{3}}} \text{------} (9)$$

Note the increasing values for $\triangle t_c / \triangle t_o$ in Fig. 11 in the region where radial outflow begins. It must be remembered that Equation 6 is valid only for decreasing values of $\triangle t_c / \triangle t_o$. As shown in Fig. 11, Equation 9 approximates Helander's correlation equation.

Conclusions and Recommendations

Equations are given in this paper to provide a basis for exploring the performance of all non-isothermal air jets, heated or cooled, discharging vertically into undisturbed space, either upward or downward. Approximate values of the constants in these equations are given, based on theory and available experimental data, but suggestions are made for additional experimental work to verify and refine these constants. Equations 3 and 6 give the temperature and velocity trajectory of vertically projected non-isothermal jets in which bouyancy, heat diffusion, and momentum play an important part. Equations 1 and 2 are the familiar velocity equations covering isothermal jets.

Simplifying assumptions have been made, as in all analytical treatments of the jet problem, and further experiment is necessary to indicate the seriousness of actual deviations from the assumed conditions. If, for instance, the differences in density between the jet medium and the ambient air are too great, the equations might give valid results if a correction involving the absolute temperature ratio is applied. The validity of the assumptions in regions of low velocities may be questionable. Each assumption should be individually checked in the laboratory in order to accurately determine its limitations.

Helander and his associates, in their extensive work on heated jets projected downward, have called attention to some of the differences between the actual conditions and those assumed for analysis. One of these is the radial escape of warm stream air in the terminal zone of a hot stream projected downward. This escaping warm air then rises and causes a change in ambient conditions for the upper part of the jet. The terminal zone and also the edge of the jet are zones of marked instability, with definite surges and fluctuations, so that the jet envelope is very difficult to define or to determine experimentally.

The equations herewith are recommended for engineering use, pending their refinement by more rigorous experimental work. The derived equations are not to be considered exact until full experimental verification is accomplished and any limitations on the empiricism determined.

Acknowledgments

Grateful acknowledgment is made of the financial support from the Designers for Industry, Inc., Research Foundation, Cleveland, Ohio, and special thanks are due V. P. Kovacik and H. R. Tuck of the Wright Air Development Center, Wright-Patterson Air Force Base, for their contributions to the mathematical analysis. The author is also indebted to Prof. G. L. Tuve for his help and suggestions. The figures were prepared by Mrs. Ruth E. Strahosky.

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Cooling Studies in a Research Home

By W. S. Harris* and P. J. Waibler**, Urbana, Ill.

SUMMARY — This investigation is the beginning of a study to determine the most practical means for providing summer comfort in homes having a steam or hot water heating system. Calculated and measured cooling loads were determined for the operating conditions of 75 F indoor temperature and outdoor temperatures up to a maximum of 100 F. The tests proved that the Research Home could be satisfactorily cooled in summer using a water chiller and room units designed to use chilled water in summer and hot water in winter. The actual maximum sensible cooling load was about 17 percent less than calculated when the maximum outdoor temperature was 100 F. Factors affecting the cooling load and cost of operation are given.

On January 2, 1940, the *Institute of Boiler and Radiator Manufacturers* entered into an agreement with the University of Illinois Engineering Experiment Station for cooperative research in the field of steam and hot water heating. This agreement has been continued since that date. During the first year the *I-B-R* Research Home was built and fully instrumented to serve as a laboratory in which the performance of heating systems could be observed with laboratory precision while operating under conditions typical of actual usage. Since construction, the Research Home has been continuously used for that purpose.

The Institute is represented by a Research Committee which proposes problems for investigation that are of the greatest interest to the manufacturers and installers of steam and hot water heating systems. This committee unanimously recommended that during the summer of 1953 an investigation be started having as its long range objective the determination of the most practical means of providing summer comfort in homes having a steam or hot water heating system. This paper discusses results obtained during the first summer of operation.

Equipment

Research Home: The *I-B-R* Research Home, Fig. 1, is a two-story building, typical of the small, well-built American home. The construction is brick veneer on wood frame, and all of the outside walls and the second story ceiling are insulated with mineral wool batts 3-5/8 in. thick. A vapor barrier was placed between the studs and the plaster base to retard the passage of water vapor from the rooms into the insulation during the winter months. The calculated coefficient of heat transmission, U, for the wall section is 0.074 Btu per (hr) (sq ft) (F deg). All windows and outside doors are weatherstripped. The windows are double hung wood sash with the exception of those in the kitchen which are of wood casement construction.

The floor plans of the Research Home are shown in Fig. 2, and a summary of the estimated cooling loads is given in Table 1. An outdoor temperature of 96 F and an indoor temperature of 75 F were selected as design conditions. No estimate was made of the probable latent load. Heat gains through the walls and roof were estimated using the equivalent temperature differential method developed by Stewart and described in Chapter 13, Cooling Load, HEATING VENTILATING AIR CONDITIONING GUIDE 1953. The heat gains through the windows were also estimated using the method recommended in THE GUIDE. Infiltration loads were estimated by using the air change method and assuming the same number of air changes for summer operation as is recommended in THE GUIDE for winter heat loss calculations. Undoubtedly these infiltration values are high for summer operation, but even though the assumed infiltration rates were high the heat gains due to infiltra-

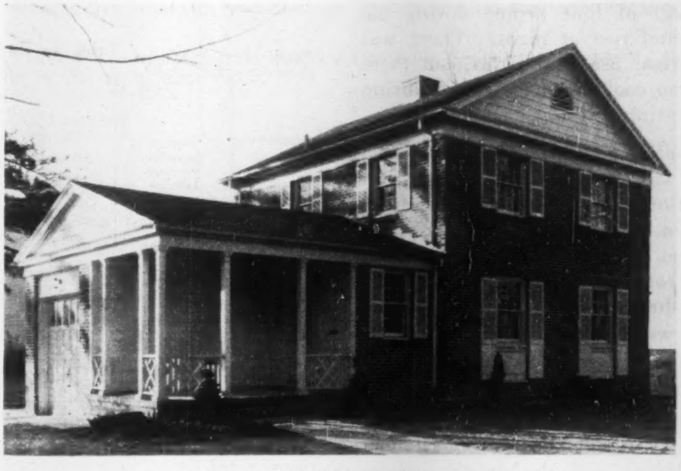

Fig. 1—*I-B-R* Research Home

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**Research associate in mechanical engineering, University of Illinois.

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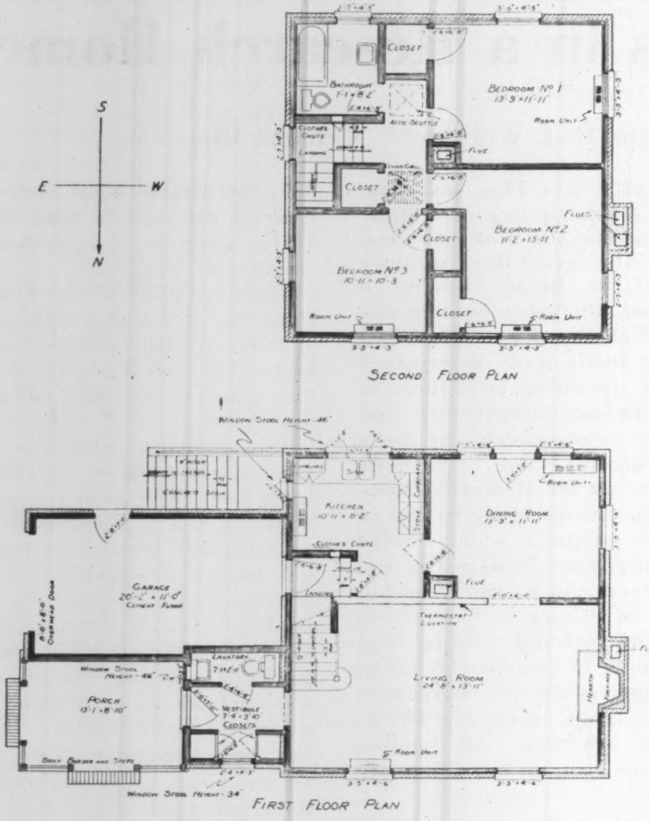
S
E
W
N
Closet
Bathroom 7'-1" × 8'-2"
Bedroom Nº 1 13'-9" × 11'-11"
Attic Scuttle
Clothes Chute
Landing
Flue
Room Unit
Closet
Flues
Bedroom Nº 2 11'-2" × 13'-11"
Closet
Bedroom Nº 3 10'-11" × 10'-3"
Room Unit
Closet
Room Unit
Second Floor Plan
Window Stool Height 46"
Concrete Stair
Cupboard
Sink
Kitchen 10'-11" × 8'-2"
Stove
Cupboard
Clothes Chute
Dining Room 13'-9" × 11'-11"
Room Unit
Garage 20'-2" × 11'-0" Cement Floor
8'-6" × 8'-0" Overhead Door
Landing
Flue
Thermostat Location
Lavatory 7'-1" × 2'-11"
Window Stool Height - 46"
Porch 13'-1" × 8'-10"
Vestibule 7'-4" × 3'-10"
Closets
Living Room 24'-8" × 13'-11"
Hearth
Fireplace
Flue
Room Unit
Brick Border and Steps
Window Stool Height - 34"
First Floor Plan

Fig. 2—Floor plan of *I-B-R* Research Home

tion are extremely small in comparison to the other loads (see Table 2).

In estimating the design cooling load no allowances were made for such internal loads as lights and occupancy; however, during the tests the house was occupied by an average of four people during the day and two at night. There was a normal usage of lights, but there was no cooking in the house during the testing season.

Cooling System: The cooling system was designed for use in conjunction with a hot water heating system. A schematic diagram of the system, consisting of a water chiller and room units resembling convectors through which either chilled or hot water can be circulated, is shown in Fig. 3. As indicated the piping was so arranged that water was circulated through the chiller and the room units during summer operation, and during the winter the same piping could be used to circulate water between the units and the boiler. In sizing the piping, the required water circulating rates for both summer and winter must be considered and the system designed to handle whichever is the larger.

In this particular case it was found that a piping system sized for winter heating was adequate for summer cooling as well. All piping was insulated with a vapor proof insulation to prevent condensation during the summer operation.

Fig. 4 shows a cross section through one of the room units illustrating the arrangement of fan, filter and coils. Condensate from the coils was collected by the drip pan from which it could be conveyed to a drain by suitable piping as shown in Fig. 3. During the tests the condensate from each unit was collected in a container and measured so as to determine the latent load being carried by each room unit.

All of the units with the exception of the one in the dining room were of the same size and selected from those commercially available. The measured air delivery for each unit at both high and low fan speeds is given in Table 1. The units were representative of available capacities most nearly approaching the estimated cooling loads of the rooms in which they were used. The manufacturer's rating for each unit, as well as the design sensible cooling load for each room, are given in Table 1.

The water chiller was rated at two tons capacity. The compressor was directly connected to a 2 hp, 220 volt, single phase motor. Both the motor and the condenser were water cooled.

Controls: The fans on the room units were manually controlled. They

Table 1—Data on House and Room Units

	Design Sensible Cooling Loads[a]	Rated Capacity of Installed Room Unit			Measured Air Delivery of Room Unit Installed	
		Water Flow Rate	Sensible Cooling[b]		Fan Speed	
			High Fan Speed	Low Fan Speed	High	Low
Room	Btu/hr	GPM	Btu/hr	Btu/hr	CFM	CFM
Kitch.	1,942	0.3		2,300	200	151
Din.	5,240	1.2	5,700		317	281
Liv.	1,138	0.3		2,300	192	167
NE Bed	1,207	0.2		1,660	208	159
NW Bed	1,383	0.2		1,660	231	185
SW Bed	2,562	0.5		2,670	217	171
Total	13,472	2.7	16,290			

[a] Based on maximum outdoor temperature = 96 F; indoor temperature = 75 F
[b] Based on 45 F entering water temperature; 75 F entering air temperature

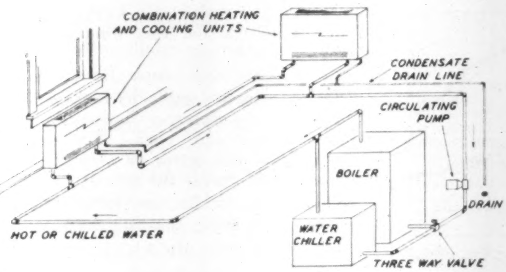

Fig. 3—Heating and cooling system

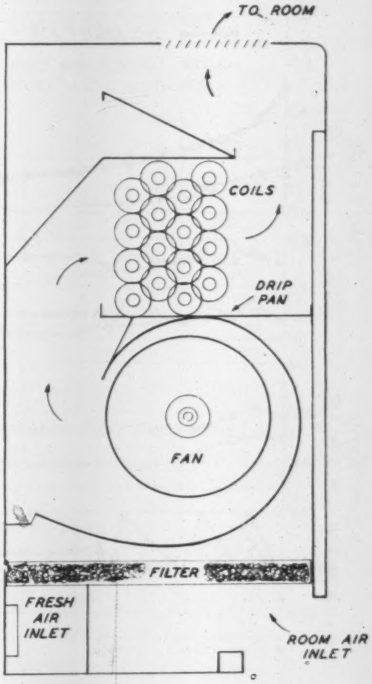

Fig. 4—Cross section through room unit

were operated continuously during tests when the windows were closed. During the series of tests conducted with the windows open at night, the fans were shut off for the open window period.

The operation of the circulating pump and the compressor motor was controlled by a room thermostat located on an inside wall (see Fig. 2) in the living room 30 in. above the floor. When the air temperature rose above the thermostat temperature setting, the thermostat started both the circulating pump and the compressor which operated until the air temperature in the living room dropped below the thermostat temperature setting. The operating differential of the thermostat was approximately 2 deg. The chiller was protected by a limit control which would stop the compressor motor at any time the water temperature in the chiller dropped below approximately 39 F.

Testing Apparatus in Research Home: Approximately 100 copper constantan thermocouples made of No. 22 B and S gage wire were permanently installed in the walls and ceilings in order to measure temperatures at important points in the structure under various operating conditions. At each of eight locations, one on each exposure of each story, nine thermocouples were installed to provide the data for complete temperature gradients through the walls. Another group of approximately 50 thermocouples provided for the measurement of air temperatures at various levels in the center of each room, in the attic, and in the basement. A third group made it possible to study the performance of the component parts of the cooling system. Provision was made for measuring the temperature of the water entering and leaving each room unit as well as the temperature of the water entering and leaving the chiller.

A central switchboard was located in the basement, and all the thermocouples were connected to selector switches on this board. In this way the electromotive force of each thermocouple could be read quickly on a precision potentiometer used in connection with a highly sensitive galvanometer. A 10 point recording potentiometer used in connection with an auxiliary switchboard made it possible to obtain either instantaneous readings or continuous printed records of the emf produced by the thermocouples in any selected group.

The rate of flow of water through the chiller was measured by installing

Table 2—Comparison of Calculated and Observed Cooling Loads. Maximum Outdoor Dry Bulb Temperature = 100 F; Average Indoor Dry Bulb Temperature = 75F; Six room units in Operation September 1, 1953

Room	Calculated Loads at 1:00 p.m. (Max. Total Load) Btu per hr						Observed Max. Load (1:30 to 4:00 p.m. DST)			Calculated Sensible Minus Observed Total Load	Observed Room-Air Temp. at 30 in. Level	
	Walls	Ceiling	Glass	Infiltration	Total Walls and Ceiling	Sensible Total	Sensible	Latent	Total		Max	Min
Kitchen	241	—	1,735	131	241	2,107	1,718	0	1,718	389	77	74
Din Rm	173	—	4,925	604	173	5,702	2,360	27	2,387	3,315	77	73
Liv Rm	276	14	990	277	290	1,557	2,134	171	2,305	−748	76	74
Total 1st Story	690	14	7,650	1,012	704	9,366	6,212	198	6,410	2,956		
N.E. Bed	245	159	908	140	404	1,452	1,741	74	1,815	−363	75	72
N.W. Bed	131	222	890	140	353	1,383	2,193	56	2,249	−866	74	71
S.W. Bed	240	220	1,962	140	460	2,562	2,142	59	2,201	361	76	73
Total 2nd Story	616	601	3,760	420	1,217	5,397	6,076	189	6,265	−868		
House Total	1,306	615	11,410	1,432	1,921	14,763	12,288	387	12,675	2,088		

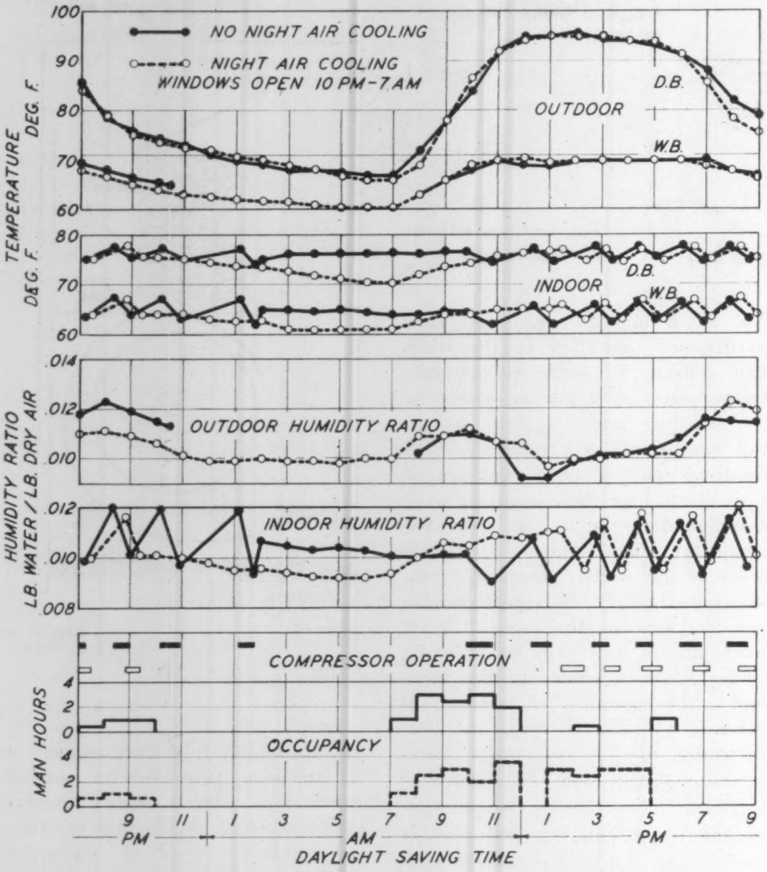

Fig. 5—Temperature and humidity with and without night air cooling

an elbow meter† in the return main. It was used in connection with a sensitive differential pressure recorder. This type of meter introduces no additional resistance to the flow of water.

The pressure drop through each room unit and the connecting piping was measured by a mercury manometer. Prior to the testing season, the relationship between the pressure loss and rate of water flow was determined for each of the room units so that the pressure losses could be used to measure the respective water flow rates during a test.

Recording thermometers were used to make continuous records of the air temperatures in each of the six rooms. The moisture content of the air was measured by means of four humidity indicators, one recording hygrometer, and one wet- and dry-bulb recorder which were checked periodically with an aspirated psychrometer. The electrical inputs to circulator and compressor motors were measured by means of integrating watt-hour meters having scale divisions of 10 watt-hours. Self-starting electric clocks were wired into the compressor and circulator motor circuits to indicate the total time of operation.

Test Conditions and Methods

The following three test conditions were used:

1. Windows closed at all times and no ventilation air other than normal infiltration supplied to the house.
2. Windows closed at all times but mechanical ventilation supplied by the continuous operation of a kitchen exhaust fan, located in the east window of the kitchen.
3. Windows open from 10:00 p.m. to 7:00 a.m. In this series the cooling equipment was not operated during the time the windows were open. For part of the tests in this series no ventilation air was supplied during the time the windows were closed; in the remaining tests the kitchen ventilating fan was used.

In some tests, the number of room units in operation was varied from a maximum of six, one in each of the major rooms, to a minimum of two, one in the living room and the other in the northeast bedroom.

The selection of these test conditions and methods of operation made possible three separate comparisons of operating costs and comfort produced in the house: (1) the effect of the number of room units in operation; (2) the effect of ventilation air; and (3) the effect of night air cooling.

In all tests the thermostat was set to maintain an average indoor temperature of 75 F. Except for some special tests, each test was 24 hr in length. In addition to those conditions continuously recorded by instruments, it was customary to read all room-air temperatures at levels of 3 in., 30 in., and 60 in. above the floor and 3 in. below the ceiling, the relative humidity in each room, and the quantity of water removed from the room air two to four times during each test. The power consumption of the compressor and circulating pump motors was recorded for each test period. The temperature of the water entering and leaving the chiller and each of the room units as well as the respective flow rates were also taken during at least one cycle of operation for each of the tests.

Results

Operation on a Typical Day: Fig. 5 is a graphic log of test conditions for two representative 24-hr test days which began at 7:00 p.m. The solid lines of the plot represent the data of a test period in which the chiller operation was controlled at all times by the room thermostat. Three room units were in use; one in the living room, one in the northeast bedroom, and one in the south bedroom.

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†The Use of an Elbow in a Pipe Line for Determining the Rate of Flow in the Pipe (*University of Illinois Engineering Experiment Station Bulletin No. 289*, 1936).

Table 3—Effect of Number of Units on Performance

TEST I—July 28, 1953

Maximum Outdoor Temperature	92.5 F
Average Outdoor Temperature	83.1 F
Average Outdoor Humidity Ratio	0.0155 lb/lb
Average Indoor Temperature	76.3 F
Average Indoor Relative Humidity	69.9 percent
Average Indoor Humidity Ratio	0.0135 lb/lb
Total Water Removed From Air	8.4 lb
Compressor Operating Time	7.52 hr
Pump Operating Time	7.52 hr
Total Operating Cost (per day)	$1.14
Average Temperature of Chilled Water Supplied to Units	54.3 F

Room	Kitch	Din Rm	Liv Rm	SW Bed	NW Bed	NE Bed
Unit in Operation	Yes	Yes	Yes	Yes	Yes	Yes
Fan Speed	High	High	Low	High	High	High
Max Air Temp, 30 in. Level, F	75.5	77.0	76.5	79.5	79.5	79.5
Min Air Temp, 30 in. Level, F	71.0	73.5	74.5	76.5	76.0	76.0
Water Removed from Air, lb	0.7	0.8	2.9	1.2	1.8	1.0

TEST II—July 30, 1953

Maximum Outdoor Temperature	90.0 F
Average Outdoor Temperature	81.6 F
Average Outdoor Humidity Ratio	0.0175 lb/lb
Average Indoor Temperature	75.4 F
Average Indoor Relative Humidity	63.3 percent
Average Indoor Humidity Ratio	0.0119 lb/lb
Total Water Removed From Air	23.4 lb
Compressor Operating Time	8.10 hr
Pump Operating Time	8.10 hr
Total Operating Cost (per day)	$1.00
Average Temperature of Chilled Water Supplied to Units	48.6 F

Room	Kitch	Din Rm	Liv Rm	SW Bed	NW Bed	NE Bed
Unit in Operation	No	No	Yes	Yes	Yes	Yes
Fan Speed	—	—	High	Low	Low	Low
Max Air Temp, 30 in. Level, F	78.0	77.5	76.5	76.5	76.0	76.0
Min Air Temp, 30 in. Level, F	76.5	76.0	74.5	73.0	72.0	72.5
Water Removed from Air, lb	—	—	9.2	5.9	4.8	3.5

TEST III—August 3, 1953

Maximum Outdoor Temperature	95.5 F
Average Outdoor Temperature	81.3 F
Average Outdoor Humidity Ratio	0.0168 lb/lb
Average Indoor Temperature	78.9 F
Average Indoor Relative Humidity	59.5 percent
Average Indoor Humidity Ratio	0.0127 lb/lb
Total Water Removed From Air	24.4 lb
Compressor Operating Time	7.03 hr
Pump Operating Time	10.37 hr
Total Operating Cost (per day)	$0.82
Average Temperature of Chilled Water Supplied to Units	42.4 F

Room	Kitch	Din Rm	Liv Rm	SW Bed	NW Bed	NE Bed
Unit in Operation	No	No	Yes	No	No	Yes
Fan Speed	—	—	High	—	—	Low
Max Air Temp, 30 in. Level, F	78.5	78.5	77.0	81.0	81.0	79.0
Min Air Temp, 30 in. Level, F	77.5	77.5	75.0	80.5	80.0	76.5
Water Removed from Air, lb	—	—	14.3	—	—	10.1

House air was exhausted by means of a continuously operating kitchen fan. All windows were kept closed.

The outdoor temperature was 85.5 F at 7:00 p.m., fell through the night to a low of 67 F at 7:00 a.m. and rose again to 96 F at noon with approximately seven hours when the temperature exceeded 90 F. The 24 hr average temperature was 82.3 F. The outdoor wet bulb temperature had a minimum of 60.5 F at 7:00 a.m. and a maximum of 69.5 F at noon. The relative humidity (not shown) increased to a maximum of 72 percent during the night and decreased to a minimum of 26 percent during the warmest part of the day.

The chiller was operating at the beginning of the test period, 7:00 a.m., and operated four times during the night, the final operation ending at 1:45 a.m. An 8-hr period followed with no compressor operation, the first operation during daylight hours occurring at 9:55 a.m. The chiller operated at approximately 2 hr intervals for the rest of the test period.

Each operation of the chiller and circulating pump caused a drop of about 2 deg in the average indoor dry bulb temperature and a drop of about 4 deg in the average indoor wet bulb temperature. The average indoor relative humidity for the 24 hr was about 55 percent.

Comparison of Measured and Calculated Cooling Loads: Table 2 shows a comparison of calculated and observed cooling loads for a day when the maximum outdoor temperature was 100 F. Calculating the cooling loads by the procedure outlined in THE GUIDE indicated that the maximum load should occur about 1:00 p.m. DST. The observed maximum load did not occur until about 1:30 p.m. and continued until about 4:00 p.m. The total measured maximum sensible cooling load for the house was only 12,288 Btu per hr as compared to a calculated maximum sensible load of 14,763 Btu per hr.

The calculated heat gains for rooms having southern exposures were high compared to the actual measured cooling load, while for the rooms having northern exposures the calculated loads were lower than those actually observed. When operating with all room doors open there is air movement from room to room, and hence there is some transfer of load from one room to another. The measured loads (Table 2) were obtained after the water flow to each of the room units had been adjusted to give the best possible balance of room air temperatures. There was only 3 deg difference in temperature between the warmest and the coolest rooms in the house, the rooms with south exposures being warmer. Thus, it is probable that any transfer of load from one room to another was from those on the south side to the north side. This would make the differences between measured and calculated loads even greater than those indicated by Table 2.

The magnitudes of the differences between measured and calculated heat gains were sufficiently large that they could not be attributed to errors in the estimation of wall and ceiling gains alone. In fact, the data seem to indicate that most of the discrepancy between calculated and measured loads must be in the estimated heat gains through the glass areas. When estimating cooling loads it is common practice to assume that all radiant energy transmitted through glass is immediately available to heat the air in the rooms. Actually this energy is not transformed to heat until it strikes some solid object, which is warmed and then heats the room air by convection. There is a finite time lag between the time the radiant energy is transmitted through the windows and the time it actually warms the room air. Furthermore, the convective heat transfer rate between the objects warmed by radiation and the air in the room is not necessarily as high as the rate at which solar radiation is received by objects in the room. Ignoring these facts would tend to make the maximum estimated instantaneous load occur earlier and have a larger magnitude than the actual instantaneous loads on the cooling equipment.

The present methods of estimating solar heat gains through glass areas are really methods of determining the instantaneous transmittance of solar energy through the glass and do not necessarily reflect the rate at which the solar energy eventually warms the air in the room. The latter affects the load on the cooling equipment.

Relationship Between the Number of Units and Cooling Performance: One series of tests was made in which the windows were closed at all times, and the number of room units in operation was changed from a maximum of six to a minimum of two. From this series three days having approximately the same average outdoor temperatures have been selected. During one of these days the Research Home was cooled with all six room units operating. During the second day four of the room units were in operation, and during the third day only two room units were used.

Table 3 presents a summary of outdoor temperatures and general operating conditions for these three days. With all six room units in operation the average indoor air temperature was maintained at 76 F, but due to short operating time and the high water temperature only 8.4 lb of water were removed from the air. As a result, the relative humidity was almost 70 percent, too high for comfort. The operating cost was $1.14 per day for electricity and water used. Between an on- and off-period, the variation in air temperature in any room was 3 to 4 deg, with a similar variation in average air temperature from room to room.

When the number of units in operation was reduced to four (Test II) the capacity of the system was correspondingly reduced which made it necessary to operate for a longer period of time and with a lower water temperature in order to cool the room air to 75 F. At these operating conditions, more than 23 lb of water were removed from the air, resulting in a relative humidity of approximately 63 percent. Eliminating the use of two of the six room units reduced the combined cooling capacity of the room units by about one third. The total operating cost during Test II was $1.00 as compared to $1.14 for Test I. Practically all of the reduction in operating cost was attributed to the fact that only four-room unit fans were in operation during Test II whereas six were in operation during Test I.

In Test III the room unit in the northeast bedroom did not have sufficient capacity to cool the entire second story. As a result, second story air temperatures were 2 or 3 deg higher than normal, and the average indoor temperature for the test was 78.9 F, as compared to approximately 76 F for Tests I and II. Again, approximately 24 lb of water were removed from the room air and the resulting indoor relative humidity was just under 60 percent. Since no changes were made in the water chiller, it had a greater capacity than required by the two room units, and therefore the compressor motor was cycled by action of the limit control during each cooling cycle. The operating cost for Test No. III was only $0.82. About 90 percent of the difference in the operating cost of Tests I and III was the result of using only two unit fans in Test III, while 6 were used in Test I. The other 10 percent was due to an actual reduction in the total time of operation of the compressor in Test III.

In the course of the summer of testing, the flow rate of the condenser cooling water was varied in an attempt to find the minimum acceptable. In the analysis of data of comparable days, as in Table 3, it was found that the actual condenser cooling water rates were not the same. To reduce cost comparisons to a comparable basis, actual cooling water consumptions were corrected to a common flow rate. It was assumed that the changes in cooling water flow rate involved in these would not change the chiller performance appreciably.

This series of tests demonstrated that as long as room doors are not closed a satisfactory cooling job can be done without providing a unit in every room. The room air temperatures reported in Table 3 show that in Tests II and III the average air temperature in the living room was only 2 deg lower than that in the dining room or kitchen even though no cooling was provided in the latter two rooms. Also, the cyclic variation in the first story temperatures between the on- and off-periods was less in Tests II and III where only the unit in the living room was in operation than in Test I where cooling units were in operation in all three rooms. Test III shows that except for somewhat higher average air temperatures, exactly these same characteristics were exhibited on the second story even though these rooms were more or less isolated from one another. If the unit in the northeast bedroom had sufficient capacity to reduce the average air temperature in this room 1.5 deg lower than it did in Test III, there is every reason to believe that the same reduction in temperature would have occurred in the other bedrooms. Therefore, two units of proper capacity could have cooled all of the Research Home with a maximum room-to-room temperature difference of about 2 deg, while the operating cost would be much less than if units were used in all six rooms.

It may be concluded from this series of tests that decreasing the number of room units in operation resulted in:

1. Decrease of the cyclic air temperature variation in the rooms.
2. Slight improvement in the temperature balance between rooms up to the point where the number of units in operation was not adequate to carry the entire load.
3. Increase in the amount of water removed from the air and a lower relative humidity in the rooms.
4. Reduced operating cost.

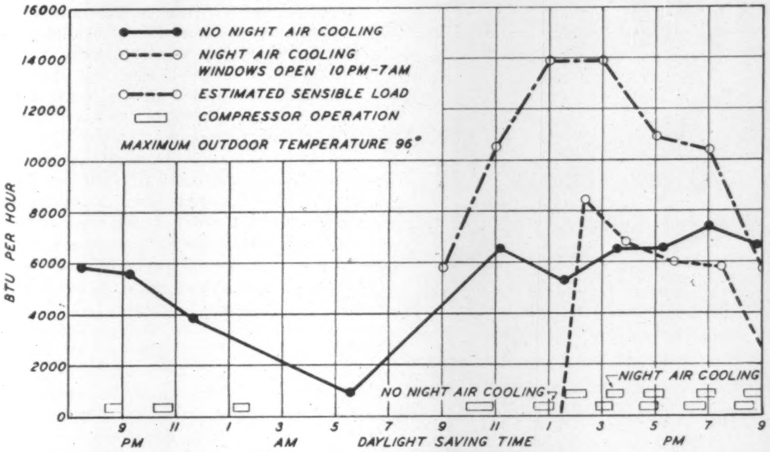


Fig. 6—Cooling load with and without night air cooling

These tests demonstrate that with the cooling equipment used in these tests, the installation of room units having a capacity in excess of that required decreases the quality of performance from the standpoint of comfort and increases the cost of operation. On the other hand, it is quite essential that the capacity of the water chiller be sufficient to reduce the temperature of the water in the system to the minimum value in a reasonable period of time. This is important if adequate dehumidification is to be obtained.

Night Air Cooling: The curves in Fig. 5 show the indoor and outdoor conditions for two 24-hr test periods. These two test periods were almost exact duplicates as far as outdoor temperature and humidity were concerned. During one of the test periods the windows were closed all of the time and the cooling system was controlled by the thermostat. During the other test period all windows were opened from 10:00 p.m. to 7:00 a.m. The cooling unit was not operated during the time the windows were open.

While the outdoor temperature was 95 F from noon to about 5:00 p.m., it was 75 F or less from 9:00 p.m. to 8:30 a.m., reaching a low of approximately 67 F between 5:00 and 7:00 a.m. A diurnal temperature variation of about 25 deg is typical of summer conditions in Urbana. Even though the summer of 1953 was one of the warmest on record in Urbana, there were only five days during the summer in which the minimum outdoor temperature was above 75 F and 16 days when the minimum outdoor temperature was between 70 and 75 F.

Fig. 5 shows that during the night, both the indoor dry bulb temperature and humidity ratio were lower for the test period in which the windows were opened than for the test made with closed windows. During the rest of the day the indoor conditions were essentially the same for both tests.

The estimated sensible cooling load between the hours of 9:00 a.m. and 9:00 p.m. DST and the measured total load during each operating cycle of the two tests are shown in Fig. 6. It can be seen that the measured loads were well under the calculated load during the heat of the day. For the test made with closed windows, the measured load exceeded the calculated load after 8:00 p.m. Because of heat storage in the house and furnishings there was some cooling load all night long during the test with closed windows even though the outdoor temperature was well below the desired indoor temperature. On the other hand, there was no need of cooling in the house from 10:00 p.m. until 1:30 the following afternoon when operating with open windows at night.

Opening the windows at night had little or no effect on the maximum cooling load, and hence on the capacity of cooling equipment required; it merely shortened the length of time the cooling system had to operate in order to maintain comfortable indoor temperatures. In the section of this report in which costs are discussed, it is shown that by making use of night air cooling operating costs were reduced by almost 50 percent.

Ventilation Air: To demonstrate the effect of ventilation air on the cooling load a few tests were made in which the cooling system was operated with closed windows at all times, and air was exhausted by means of an exhaust fan located in the east window of the kitchen and operated continuously during the test period. No special provision was made for the entrance of outdoor air into the house. The measured free air delivery of the exhaust fan was 430 cfm.

The tests revealed that the ventilation air increased the maximum load by approximately 25 percent and the total daily load by about 10 percent. At no time did those working or sleeping in the house notice that the operation of the exhaust fan increased the quality or *freshness* of the air in the house. Although there seemed to be no need of mechanical ventilation, it is probable that in homes it might be required at times when food is being cooked, unusual occupancy or heavy smoking. Ventilation during these times could be provided by a small kitchen exhaust fan. If windows are opened at night, there is even less need of mechanical ventilation.

Operating Costs:[°] The operating costs are determined by the quantity of cooling water used; the power consumption of the compressor, the pump and the fans on the room units; and the respective power and water rates. Table 4 shows a breakdown of the power and water consumptions and operating costs based on average rates at Urbana. Four methods of operation are represented, and in each case the maximum outdoor temperature was approximately 95 F.

In each case the cost of the electrical energy used to operate the

Table 4—Operating Costs

Test	A		B		C		D		E	
No. of Units Operating	6		3		3		3		3	
Night Air Cooling	No		No		No		No		Yes	
Ventilation Air	No		No		Yes		Yes		Yes	
Maximum Outdoor DB	92.5		95.0		96.0		96.0		96.0	
Minimum Outdoor DB	71.5		74.0		72.0		67.0		67.0	
Average Outdoor DB	83.1		84.4		82.3		80.3		81.0	
Average Indoor DB	76.3		77.0		76.0		76.0		74.7	
	KWH	Cost	KWH	Cost	KWH	Cost	KWH	Cost	KWH	Cost
Compressor	16.3	$0.407	13.6	$0.340	14.8	$0.370	12.6	$0.315	7.3	$0.182
Pump	1.9	0.048	1.8	0.045	1.9	0.048	1.6	0.040	1.0	0.025
Room Unit Fans	15.3	0.381	5.3	0.134	5.3	0.134	5.3	0.134	3.1	0.078
Kitch. Vent. Fan	0	0.0	0	0.0	1.1	0.027	1.1	0.027	0.6	0.015
Total Power	33.5	0.836	20.7	0.519	23.1	0.579	20.6	0.516	12.0	0.300
	Cu ft		Cu ft		Cu ft		Cu ft		Cu ft	
Cooling Water	83.0	0.303	73.3	0.269	79.5	0.292	67.5	0.248	39.1	0.146
Total Operating Cost		$1.139		$0.788		$0.869		$0.764		$0.446
Power Percent of Total		73.2		66.0		66.5		67.5		67.4

cooling system amounted to approximately 65 to 70 percent of the total operating cost, with the cost of cooling water making up the balance. Tests A and B show that reducing the number of room units in operation from 6 to 3 reduced the daily operating cost from $1.139 to $0.788. Tests B and C show that the operation of the kitchen ventilating fan increased the cost of operation of the cooling system by about 10 percent.

The operating conditions for Tests C and D were the same except that the average outdoor temperature between 10:00 p.m. and 7:00 a.m. was 75.6 F in Test C and 69.4 F in Test D. The temperature during the daylight hours was the same for both tests. The cooler night air brought into the house by the ventilating fan during Test D reduced the cooling requirements during the night and early morning sufficiently to effect a net reduction in daily operating cost of about 12 percent as compared to Test C.

A comparison of Tests D and E reveals that opening the windows from 10:00 p.m. to 7:00 a.m. reduced the cost of operation from $0.764 to $0.446 per day.

The foregoing cost figures are only approximate as the shortness of the testing season permitted the running of only one or two tests for each operating condition, and this was not sufficient to average out such effects as day-to-day variations in wind, sun intensity, and outdoor humidity.

Conclusions

The tests made in the *I-B-R* Research Home during the summer of 1953 have indicated that:

1. The Research Home could be satisfactorily cooled in summer using a water chiller and room units designed to use chilled water in summer and hot water in winter.

2. The same piping system may be used for both the summer and winter phases of operation providing it is covered with a vapor proof insulation to prevent sweating when chilled water is being circulated.

3. With a maximum outdoor temperature of 100 F, the measured maximum sensible cooling load was about 17 percent less than the maximum sensible load determined by conventional methods of estimating cooling loads.

4. Most of the differences between the estimated and observed maximum cooling loads could be attributed to the method of estimating heat gains through glass areas.

5. In estimating cooling loads it is assumed that all radiant energy transmitted through glass is immediately available to heat the air in the room. Actually it first heats objects in the room, and they in turn heat the room air by convection. This results in a time lag and a reduced rate of heat release to the air.

6. As long as room doors are not closed, a satisfactory cooling job could be done in the entire Research Home by operating cooling units in only two or three rooms.

7. With the type of equipment used in these tests, the installation of room units having a cooling capacity in excess of the maximum required decreases the quality of performance from the standpoint of comfort and increases the cost of operation.

8. For satisfactory results the capacity of the water chiller must be sufficient to quickly reduce the temperature of the water in the system to the minimum value.

9. Opening windows at night had no effect on the maximum cooling load, but except for a very few days in Urbana, this practice results in equal or better comfort conditions in the house than obtained by operating with the windows closed at all times.

10. Opening windows at night reduced the cost of operation by as much as 50 percent.

11. Operating a kitchen exhaust fan having a free air delivery of 430 cfm increased the maximum cooling load by about 25 percent and increased the daily cost of operation by about 10 percent.

12. From the standpoint of comfort there appeared to be no need of mechanical ventilation for the test conditions. Some such ventilation might be required during periods when foods are being cooked or at times of unusual occupancy or heavy smoking.

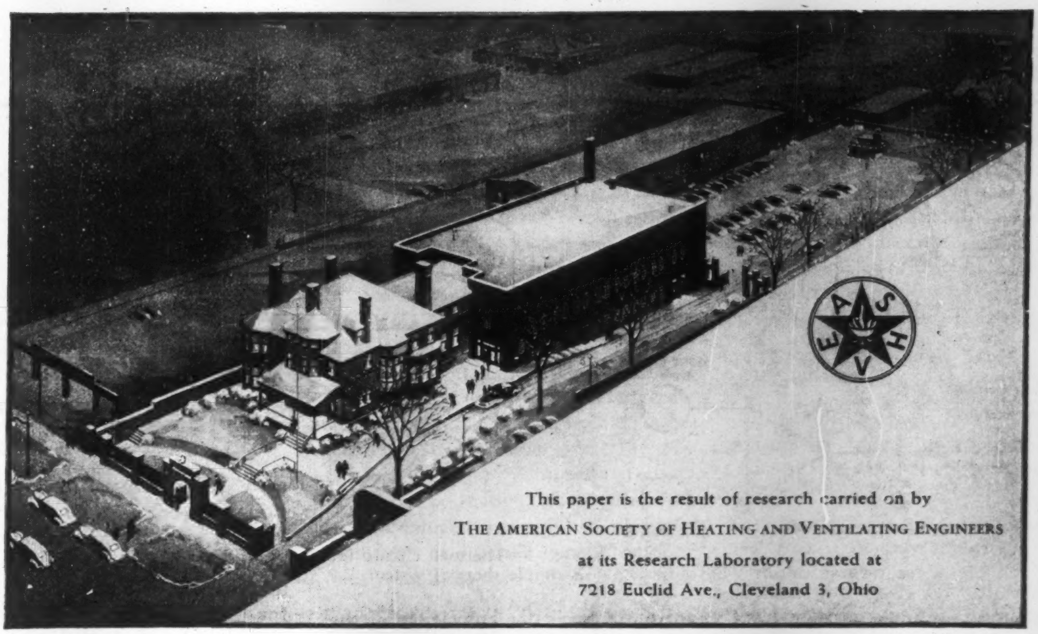
13. The daily operating cost for a design day varies from $1.139 to $0.446 depending upon the method of operation. The highest operating cost was obtained when using all six room units and operating with closed windows at all times. The lowest operating cost was obtained when using only three room units and operating with the windows open from 10:00 p.m. to 7:00 a.m.

F. PAUL ANDERSON AWARD

The Committee of Award for the F. Paul Anderson Medal announces that nominations for the F. Paul Anderson Medal for 1954 are invited. Any member of the Society is eligible for nomination. The award is made in recognition of work done or service performed in the field of heating, ventilating or air conditioning.

Nominations, together with a full statement of the candidates' qualifications and achievements, should be sent to the Committee at ASHVE Headquarters, 62 Worth St., New York 13, N.Y., prior to August 1, 1954.

F. Paul Anderson Committee
J. E. Haines, *Chairman*
Lester T. Avery L. E. Seeley
S. R. Lewis B. M. Woods



This paper is the result of research carried on by
THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS
at its Research Laboratory located at
7218 Euclid Ave., Cleveland 3, Ohio

Circuit Analysis Applied to Load Estimating

By H. B. Nottage*, Santa Monica, Calif. and G. V. Parmelee**, Cleveland, Ohio

SUMMARY — This paper is a progress report on the development of improved methods of estimating instantaneous air conditioning system loads for buildings which are subjected to variations in outdoor air temperature and intensity of solar and sky radiation. A room with a north exposure has been used as an example to illustrate a new load calculation procedure which takes into account heat storage in all walls, the floor, the ceiling, and the room contents. An essential feature of this procedure is the representation of the thermal system in question by a *thermal circuit* diagram. The thermal circuit for the room was analyzed by a method well established in analyzing similar electrical networks. The procedure has been outlined in the paper and calculation details have been placed in Appendices.

The variation of temperature with time for each surface of the room has been determined for steady periodic variations in the sol-air temperature of the wall and in the temperature of the window. From these temperatures the heat transferred to the room air, that is, the instantaneous load on the air conditioning system, has been determined for each hour of the day. These first results show that the load-estimating method which is currently given in THE GUIDE results in appreciable over-estimates of peak loads. Moreover, in this example the peak load occurs later than would be predicted by the method in THE GUIDE. The demonstration that instantaneous temperatures and heat flow rates throughout the system are readily determined is of great practical importance. Much remains to be done toward making the method easily usable in everyday work, but the principles of circuit analysis are well established.

AIR CONDITIONING engineers have long recognized that the capacity of a structure for storing heat has a significant effect on the equipment load when the structure is subjected, as in summer, to a variation in solar radiation intensity and outdoor temperature. Recent years have seen the development of means of computing rates of heat flow through walls and roofs subjected to steady periodic variations in the weather elements. These take into account the heat capacity of only the outer sections of the building. Heat gain data for sunlit glass sections of various types also are now available, and convenient tables for establishing instantaneous heat gain for walls, roofs and glass have been published

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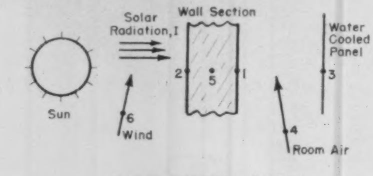
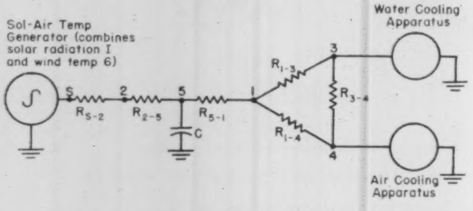
JOURNAL SECTION



a. THE THERMAL SYSTEM



b. THE THERMAL CIRCUIT

Fig. 1—Thermal circuit for a simple thermal system

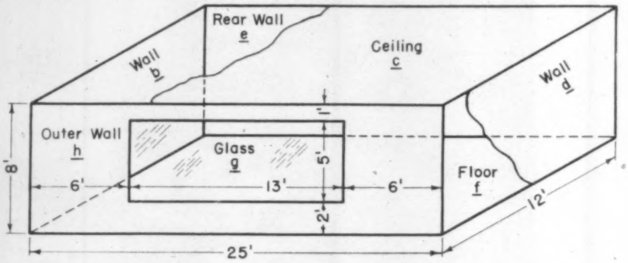


Fig. 2—Sketch of room for illustrative example

in The Guide for some years. However, these data give instantaneous rates of heat entry into the air conditioned space, and therefore account must be taken of the fact that the radiation component of these gains is not directly transferred to the air (except for a small amount of absorption) but instead warms the interior surfaces of the space. Because these interior sections absorb and store part of this radiant energy, re-radiate part, and transfer the balance by convection to the room air, the actual load on the conditioning system is considerably different from the instantaneous rate of heat flow into the space.

It is apparent that load estimating methods must be extended to include the heat capacity of the internal structure; that is, the entire thermal system must be considered. Improved knowledge of the time-variable behavior of the system load on an air conditioning installation will result in significant cost reduction by: (1) avoiding excessive installed capacity, and (2) operating with minimum power consumption throughout the daily operating cycle. Improved knowledge also will enable engineers to make more effective designs with full consideration of solar energy and of structural heat-storage capacity and will improve their understanding of how the building and its air conditioning system will adjust to weather changes.

In addition, the proper application of automatic controls will be enhanced by better knowledge of the significant instantaneous temperatures and heat-flow rates throughout an air-conditioned structure.

During the past few years, material progress has been made in dealing with problems of internal heat storage. (See references summarized in The Guide[1] in the Chapter on Cooling Load.) This paper is a first progress report on the representation of thermal systems by *thermal circuits* and on the application of electrical-circuit techniques to the analysis of thermal circuits and the calculation of air conditioning loads. The objectives are:

1. To introduce the use of thermal circuits in thermal system analysis and load estimating.
2. To calculate temperatures, heat flow rates and cooling loads for an illustrative thermal circuit by mathematical techniques used in electrical circuit analysis.

Advisory guidance has been given by the Technical Advisory Committees on Cooling Load† and on Heat Flow Through Glass.‡

Thermal Circuit Principles

An engineer's first step in problem solution is usually to make a diagram of the problem so that he can more readily visualize the relationship between problem elements. A thermal circuit diagram is simply a picture of a thermal system, and, in the absence of standardized symbols for thermal elements, it is expedient to use electrical symbols to represent the thermal elements, each of which has its counterpart in electrical circuits (See Table A-1, Appendix A).

In Fig. 1 the upper diagram (a) shows a thermal system consisting of a wall exposed to the sun and outdoor air on one side and to room air and a cooling panel on the inside surface. Temperatures throughout the system are designated by numbers. Temperatures 3 and 4 are maintained at constant levels by appropriate mechanical systems which discharge the heat they collect from the circulating media to some heat sink, such as the outdoor air. A sink is simply an energy receiver that maintains a constant temperature regardless of the energy it receives. The variation with time of the solar intensity I, and the temperature and velocity of the wind are known, and the variations of temperatures 1, 2, and 5 with time are to be found.

These temperatures can be found by writing a heat balance equation for each point and solving these equations simultaneously. For example, the temperature at point 1 is such that the heat conducted to it from within the wall equals the heat it loses by convection to the room air at temperature t_4 and in the net radiation exchange with the cooling panel at temperature t_3. This equality, simply a statement of the energy conservation law, holds for both steady and non-steady heat flow.

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[1] Exponent numerals refer to References.

†*Personnel*: C. O. Mackey, *chairman;* K. O. Alexander, John Everetts, Jr., L. F. Fisher, W. F. Friend, H. T. Gilkey, R. H. Heilman, H. W. Heisterkamp, A. J. Hess, R. C. Jordan, A. T. Jorn, C. F. Kayan, J. N. Livermore, P. E. McNall, Jr., I. A. Naman, H. B. Nottage, R. W. Roose, J. P. Stewart, H. B. Vincent, W. E. Zieber.

‡*Personnel*: R. A. Miller, *chairman;* N. B. Hutcheon, W. J. Arner, F. L. Bishop, E. W. Conover, D. D'Eustachio, W. B. Ewing, J. E. Frazier, J. S. Herbert, R. W. McKinley, E. C. Miles, D. R. Muir, H. B. Vincent.

Similarly, the temperature at point 2 is such that the rate at which it absorbs solar energy equals the sum of the rates at which it loses heat to the outdoor air by convection and to the wall interior by conduction. And if the thermal capacity of the wall is placed at point 5, the temperature of this point is such that the difference between the rates of heat conduction from 2 to 5 and from 5 to point 1 equals the rate at which heat is stored in the wall.

The relationship stated by these heat balances can be more clearly understood if the thermal system is pictured as a circuit shown in diagram (b) of Fig. 1. It is commonplace now in air conditioning calculations to replace the two energy sources, the sun and the outdoor air, with a single source which produces a variable temperature, known as the sol-air temperature. This source is shown by the symbol of an electric generator, and the sol-air temperature, *s*, is connected to point 2 through a convection resistance, R_{s-2}. Similarly, conduction, convection, and radiation resistances connect the other junction temperature points in the circuit. A capacitor branch at point 5 represents the capacitance of the wall. Points 3 and 4 are tied together through a convection resistance, and are each connected to cooling equipment designated by circles in lieu of giving the complete thermal circuit of each apparatus. In practice, the equipment is selected to have sufficient capacity to maintain points 3 and 4 at the desired constant levels. The equipment, the capacitor C, and the generator are connected to a common ground, which can be thought of as an energy sink of constant temperature. Principles of evaluating circuit component quantities and of selecting the number of capacitances for proper representation are discussed in Appendices A, B, and C. Numerical details for the illustrative problems are given in Appendix D*.

The circuit resembles an electrical circuit only because electrical symbols have been used, but all quantities are thermal quantities. The point to be realized is that a thermal system is a network of energy-transfer resistances, capacitances and sources and, as such, can be represented by a circuit diagram.

Summarizing then, in a thermal network:

1. Thermal potentials are temperatures: units are in Fahrenheit degrees.
2. Thermal currents are heat flow rates; units are in Btu per hour.
3. Resistances transfer heat with a corresponding temperature drop; units are Fahrenheit degrees per Btu per hour.
4. Capacitances are heat storage elements; units are Btu per Fahrenheit degree.
5. Thermal sources produce heat, thermal sinks receive heat; units are Btu per hour.

Since the mathematical equations for periodic heat flow have counterparts in alternating current circuits, it is advantageous to use applicable methods of electrical network analysis that have already been well developed. This idea is not new, but the application of circuit diagrams and circuit analysis to thermal systems and control problems in air conditioning appears to have lagged behind the enticing possibilities. For further discussion of circuit techniques, the reader is referred to memoranda** prepared in 1951 and 1952, and presented to the Technical Advisory Committees.

Solving problems by the thermal circuit method requires the following data and steps:

1. Complete description of the physical system, involving: (*a*) dimensions; (*b*) thermal properties; (*c*) input cycles of temperature (potential) and/or heat flow rate (current); (*d*) independent variables in the surroundings of the physical system.
2. Calculation of resistances and capacitances.
3. Writing of circuit equations. These can be kept linear in the majority of problems.
4. Solving of circuit equations.
5. Practical judgment of results.

Functional details, as presented in the Appendices to this paper, may appear formidable to the uninitiated. In reality, all operations presented can be systemized and reduced to (1) tabular forms, and (2) sets of instructions. No higher mathematics is necessary. Problems are

Table 1—Assumed Structural Details and Thermal Properties for the Illustrative Example

Room Component	Designation in Fig. 2	Material	Total Thick. in.	Surface Area sq ft	k^a Btu/(hr)(sq ft)(F deg/ft)	ρ lb/cu ft	c_p Btu/lb F deg	a sq ft/hr
Floor	f	Concrete, no covering	4	300	0.41	97	0.21	0.020
Ceiling	c	Same as floor						
Interior Partitions	e	Gypsum lath & plaster	⅞	200	0.275	70	0.23	0.017
		Wood studs, 1¾ x 3¾ in. spaced 16-in. centers	—	—	0.085	30	0.40	0.007
	b,d	Same		96				
Exterior Wall	h	Brick	4	135	0.51^b	112^b	0.20	0.023
		Mortar	½	135	1.0	115	0.22	0.039
		Cinder-concrete blocks	8	135	0.40^b	57^b	0.21	0.033
		Furring space, lath & plaster, taken to be same as for interior partitions.						
Glass	g	See Fig. 5	Case I — Single common window glass, 65 sq ft Case II — Type I 8-in. glass blocks Smooth exterior faces, wide ribs or flutes on interior faces, 65 sq ft					

[a] Symbols:
k = thermal conductivity
ρ = density
c_p = unit heat capacity at constant pressure
a = thermal diffusivity

[b] For solid substance with no core holes, having the same net weight and over-all thermal resistance as the actual structural units.

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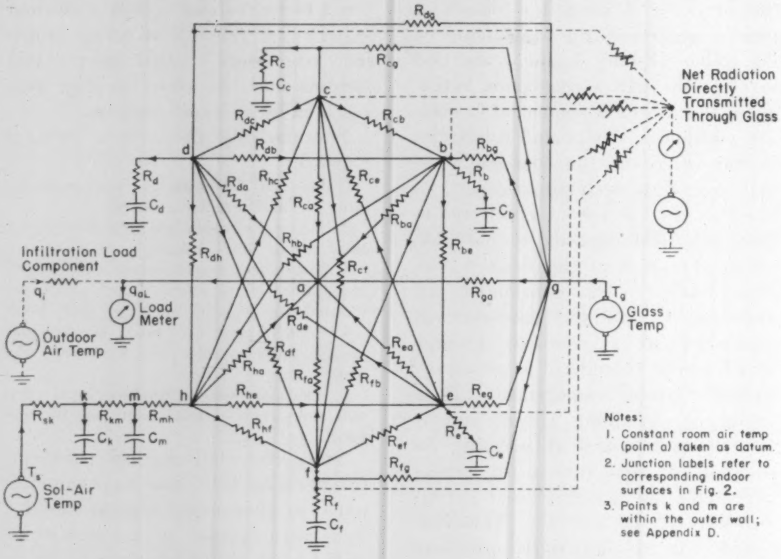
*Mimeographed copies of Appendices D, E, F, and G may be obtained on written application to the ASHVE Research Laboratory, 7218 Euclid Ave., Cleveland 3, Ohio. These will be published with the paper and with Appendices A, B, and C in the TRANSACTIONS.

**Copies are available to ASHVE Members upon request to the Research Laboratory.



Notes:

1. Constant room air temp (point a) taken as datum.
2. Junction labels refer to corresponding indoor surfaces in Fig. 2.
3. Points k and m are within the outer wall; see Appendix D.

Fig. 3—Thermal circuit to be solved (dotted portions not included in the analysis presented in this paper)

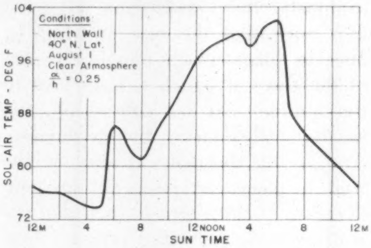


Fig. 4—Sol-air temperature cycle

solved by the application of (1) arithmetic, (2) vector representation of periodic phenomena, and (3) algebra, for the solution of simultaneous equations.

Difficulties can arise in complicated circuits. For example:

1. There may be so many simultaneous equations to solve that the sheer labor is imposing. This can be conquered, however, through the use of standard calculating machines.
2. If resistances and capacitances vary with potentials or currents, then the equations become non-linear and are much more difficult to solve. This generally calls for a special analogue.

Procedures in Analyses

Equations and tables are involved here. Study is required for proper understanding. Details have been placed in Appendices.

The presentation at this point will be limited to an illustrative example. For orientation purposes, however, the titles of the Appendices are listed as follows:

A. Definition and Inter-Conversion of Corresponding Thermal and Electrical Quantities, With Vector Notation.
B. Writing Circuit Equations.
C. Lumping of Circuit Parameters.
D. Calculation Details and Results for Thermal Resistances and Capacitances.
E. Circuit Input Potentials, Equations to be Solved, and Solutions Obtained.
F. Periodic Heat Gain by the method in The Guide for the Illustrative Example.
G. Treatment of Directly Transmitted Radiation and Radiant Energy Absorption by Room Air.

Illustrative Example

A step-by-step summary will demonstrate the procedure. Two cases are to be considered, namely:

Case I Room with single glass window.
Case II Room with glass block window.

The problem has further been subdivided into the following two phases.

Phase A Analysis *excluding* the radiation directly transmitted through the glass.

Phase B Additional effects of radiant energy directly transmitted through the glass.

The present paper treats Cases I and II, *Phase A only*. Successive steps to the desired results are given in following paragraphs A to H.

A. Sketch the physical system and list the restrictions imposed. Fig. 2 shows the chosen room schematically. Table 1 describes the material comprising the room components and lists the thermo-physical properties. Postulates are:

1. Cooling-season conditions prevail.
2. The room has one outside wall with due-north exposure.
3. The room is surrounded by similar rooms, such that the floor, ceiling, and interior partitions contain planes of no heat flow. These planes are assumed to be at the respective mid-sections.
4. All surfaces are isothermal planes — room, outside wall, and glass.
5. Room air is maintained at a uniform constant temperature.
6. No heat sources or furnishings are in the room.
7. No moisture transfer is involved.
8. No radiant energy is absorbed by the room air.
9. Independent variables, sol-air temperature, and corresponding indoor-surface glass temperature, cycle in a steady periodic state.
10. Infiltration is regarded as an instantaneous superposed load.
11. All surfaces radiate diffusely.
12. Thermal resistances and capacitances are independent of potentials or currents. For a discussion of the lumping of capacitances, see Appendix C.

B. Draw the thermal circuit.

1. Fig. 3 gives the circuit wherein the symbols are as described in the following paragraphs. (Also see Table A-1, Appendix A). The dotted branches refer to Phase B of the problem, which is to be treated in a subsequent paper.

2. Circuit junction points represent places where temperatures are to be determined; the letter symbols refer to the corresponding indoor surfaces of Fig. 2. These junction points include all room surfaces, the room air, a, and points k and m within the outer wall at positions determined by principles and calculations outlined in Appendices C and D. The constant room air temperature, at a, is taken as the datum.

3. Thermal currents flow in the various circuit branches; units are Btu per hour. In this paper current flow in a branch equals the product of potential (temperature) difference between the junction points of the branch times the admittance, *Y*, of the branch. This term is explained in detail in Appendices A and B. For the present, *Y* can be regarded as comparable to conductance in steady-state heat flow.

4. Room-air junction, a, is grounded through the system-load meter, which measures the net thermal current required to hold the air at constant potential (tem-

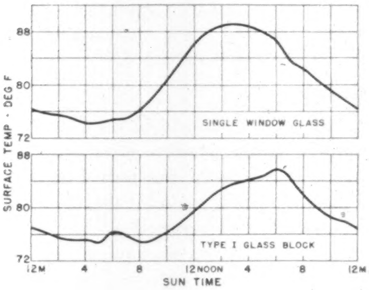


Fig. 5—Indoor glass surface temperatures compatible with sol-air temperatures of Fig. 4

perature). This gives the instantaneous load on the air conditioning equipment. In the circuit analysis, the *ground* is a so-called sink which can receive current of any magnitude and always remain at constant potential, and this is the manner in which the constant room air temperature is represented. Transposed to the air-conditioning system, the ground symbolizes equipment which somehow will always maintain the room air at a constant temperature, no matter what the instantaneous load may be. This latter concept is an idealization which could be improved by placing equipment components in the circuit, but this is beyond the present scope.

5. Room-radiation current branches run directly between the surfaces concerned; each surface is connected to each of the other surfaces which it *sees* by branches with radiation resistances R_{he}, R_{hc}, etc. The resistance values are determined in accordance with Appendix D.

6. Convection-current branches run directly between the surface concerned and the room air, a. The resistances of these branches, R_{ha}, R_{fa}, etc. are determined in accordance with Appendix D.

7. In accordance with postulate 3 of paragraph A, the circuit branches between the surfaces of the inner walls, floor, and ceiling and the mid-points of these sections consist of a conduction-current resistance, such as R_f, in series with a structural capacitance, such as C_f, connected to ground. A thermal current flows into or out from this capacitance (heat storage element) only through the resistance, R_f, in accord with the difference in potential between circuit points f and C_f. Resistance and capacitance values are determined as in Appendices C and D.

8. The conduction-current branch between the sol-air temperature and the indoor surface, *h*, of the outer wall consists of a series of resistances R_{sk}, R_{km}, and R_{mh} with structural capacitances C_k and C_m tied into this branch at points determined by methods outlined in Appendices C and D. Current flows into or out from these capacitances in accordance with potential (temperature) differences.

9. Independent input variables are the sol-air temperature, T_s, and the corresponding indoor glass-surface temperature, T_g. These sources are depicted as generators which generate potentials (temperatures) which vary with time in accordance with the conditions of the problem (see Figs. 4 and 5).

10. Infiltration and directly-transmitted radiation are drawn dotted as superposed components, with analysis reserved for the paper covering treatment of Phase B.

C. Express the cyclic input variables in the Fourier series.

1. This requires (a) a cycle shown graphically, and (b) a standard calculation form and arithmetic.

2. For the present problem, the sol-air temperature[2] is shown graphically in Fig. 4. The inner-surface glass temperatures[3] are shown in Fig. 5.

3. If the required series is lengthy, a harmonic analyzer will be helpful.

4. Data and results are summarized in Appendix E.

D. Write the circuit equations.

1. These can be written systematically, guided by a form sheet and a set of instructions if advisable.

2. It is convenient to treat the potentials as unknowns. There will be one equation for each unknown junction-point potential (temperature).

3. Results are summarized in Appendix E.

E. Calculate the circuit resistances and capacitances.

1. Methods and results are summarized in Appendix E.

2. Resistances and capacitances are combined to give admittances as described in Appendix A.

F. Solve the equations for the circuit potentials (temperatures).

1. Possible methods are: (a) algebraic, by substitution or determinants; (b) numerical; or (c) computing machine.

2. A computing machine was employed in the present instance. Results are summarized in Appendix E.

3. In complicated cases of more equations than can be handled by a conventional computing machine, or with nonlinear equations, an analogue will be helpful or may be the only workable method.

G. Calculate the thermal currents.

1. Methods and results are summarized in Appendix E.

2. Check the solution by making circuit balances at each of the circuit junction points.

H. Determine the instantaneous load and appraise the results.

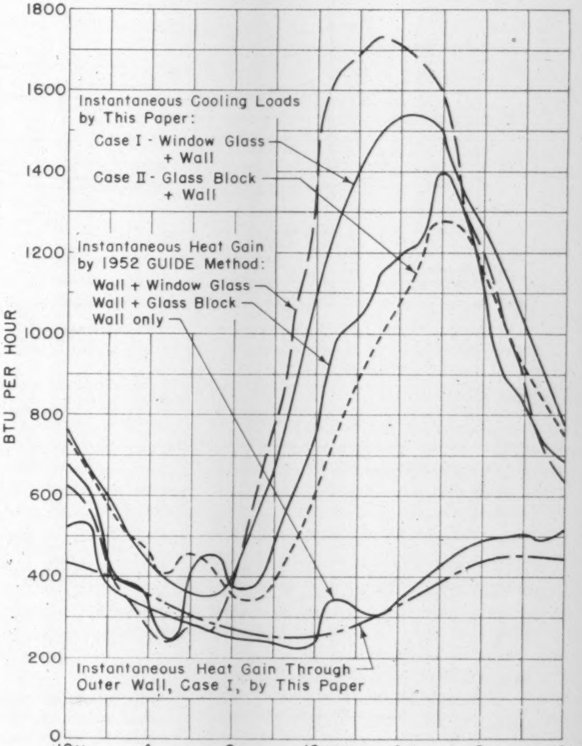


Fig. 6—Instantaneous cooling loads compared with instantaneous heat gains. Directly transmitted radiation from sun and sky is not included

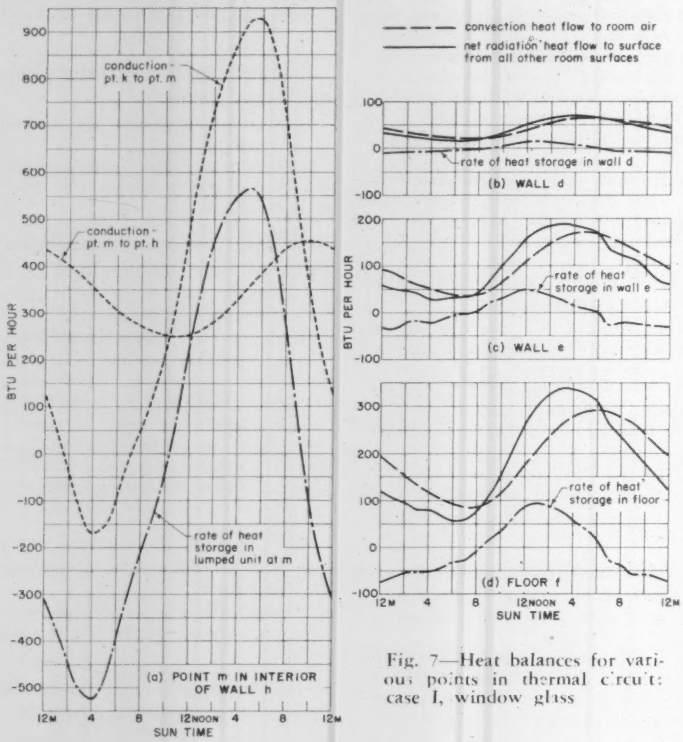


Fig. 7—Heat balances for various points in thermal circuit: case I, window glass

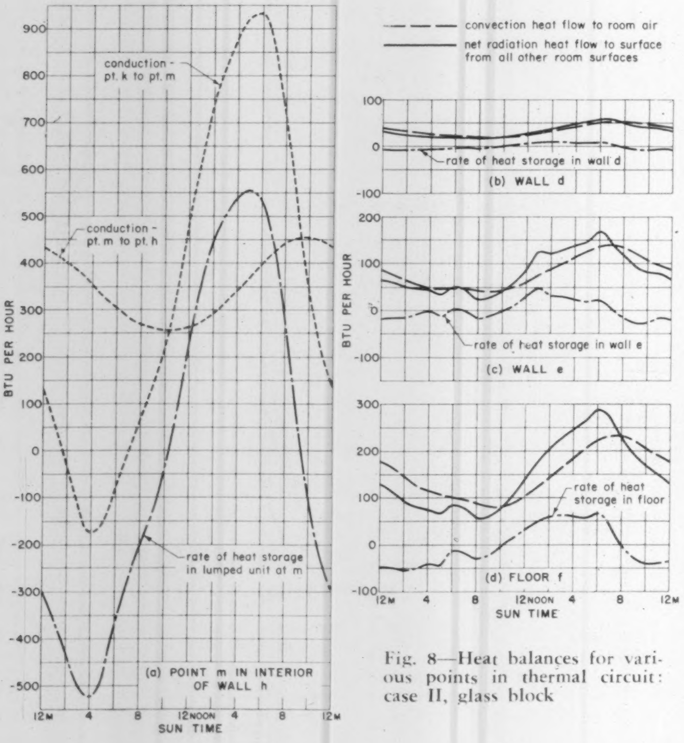


Fig. 8—Heat balances for various points in thermal circuit: case II, glass block

This is discussed in the following sections. The load is the instantaneous sum of the currents at point a, Fig. 3.

Results

All results include Cases I and II, namely, single window glass and glass block respectively, but only Phase A. Phase B, which includes the load due to directly transmitted solar radiation, is not part of the present results, but remains to be covered in a subsequent paper.

1. *Instantaneous system load*

Fig. 6 compares the thermal-circuit calculated system load with the heat gains through the outer wall and glass as determined by The Guide,1952 method.[3] (Inclusion of directly-transmitted radiation would increase the spread between the respective peaks). The fact that instantaneous heat gains over-estimate the peak system load has been pointed out before[1,4].

The fact that the night-time instantaneous system load exceeds the instantaneous heat gain rate is proper. In the steady state, the net 24-hr heat gain must equal the total 24-hr system heat removal.

2. *Instantaneous heat gain through outer wall*

Fig. 6 also compares the two methods of calculating the instantaneous heat gain through the outer wall. The curve for the wall only for Case II is nearly the same as for Case I and therefore is not shown. Both methods contain approximations and the comparison shows order-of-magnitude agreement. The method of The Guide is approximate because it consists of a steady state heat flow with a superimposed heat flow curve that exactly follows the sol-air temperature curve except that it is displaced by the time lag of the wall. The amplitude of this curve is less than that of the sol-air temperature curve, but the approximate method does not take into account the greater damping effect imposed by the wall capacitance on the higher frequency *bumps* in the sol-air temperature curve (see Fig. 4). The circuit method gives a relatively smooth wave. Investigation showed that the current flow between points m and h, that is, the rate of instantaneous heat flow into the room from the outer wall, gave results for the first harmonic within 3 percent of the flow rates based upon four harmonics. It seems doubtful that inclusion of harmonics of higher order than the 4th would significantly alter the results obtained for Phase A of this illustrative problem. The question of further subdividing the outer wall in the circuit method is concerned with a type of approximation which is considered in Appendix E.

3. *Component thermal currents*

Figs. 7 and 8, for Cases I and II respectively, show thermal currents of in-

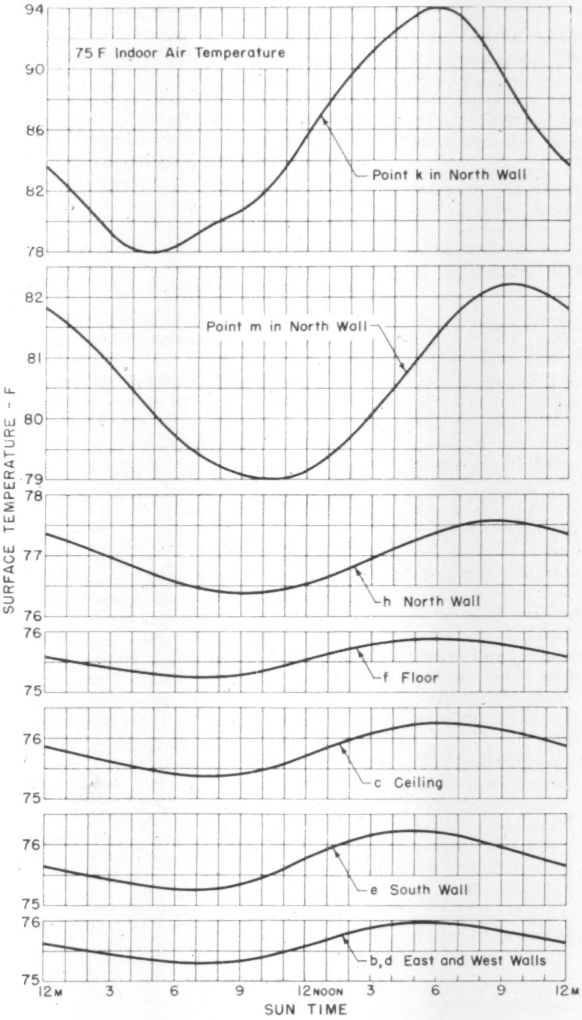


Fig. 9—Temperatures in outer wall and temperatures of indoor room surfaces: case I — flat glass window

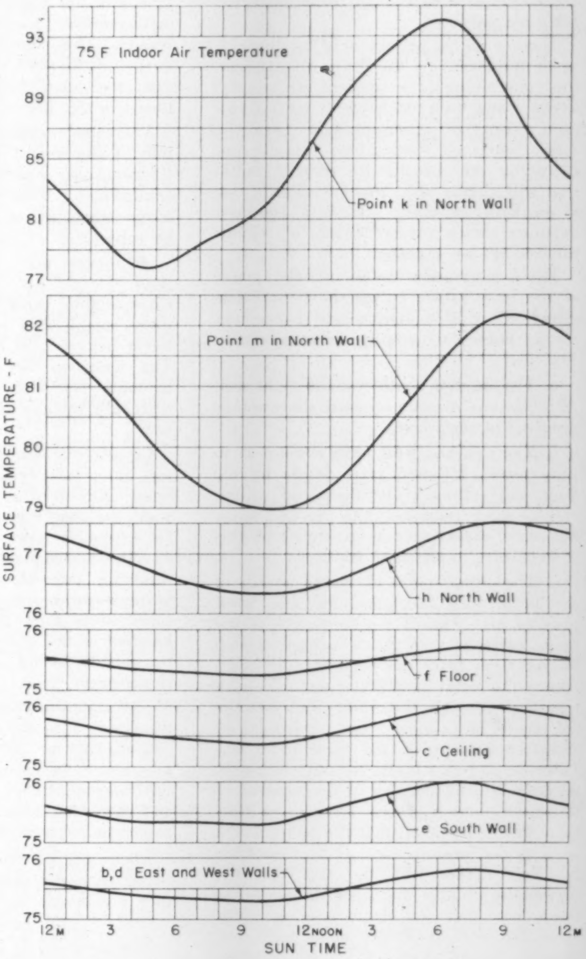


Fig. 10—Temperatures in outer wall and temperatures of indoor room surfaces: case II — glass block window

terest throughout the room. In each instance, the storage rate is the difference between the heat flow rate into a circuit point by conduction, convection, or radiation or any combination of them and the heat flow away from that point by the same modes. Over the 24-hr period the stored heat is zero. The following may be noted. (Refer to the room sketch of Fig. 2.)

Figs. 7a and 8a: The difference between the heat flow through the outer masonry-wall portion of the circuit with the single window, and that through this wall with the glass block window, is negligibly small. This is logical because the glass and the outer wall are parallel heat flow paths in each case, linked only by convection from the same air currents plus radiation reflection within the room. Also, the wall was of very heavy construction in this instance, and this helped greatly to make its behavior insensitive to differences in the glass portion.

Figs. 7b, 8b: For the end walls, d and b, the glass block produces an appreciably greater time lag and a slight decrease in amplitude. This agrees with expectations.

Figs. 7c, 8c: The rear wall, e, is strongly influenced by radiation from the glass and outer wall. The greater resistance and capacitance of the glass block have the expected effect.

Figs. 7d, 8d: The floor, f, has a high capacitance and shows a very large time lag in combination with the glass block. The ceiling would have a similar behavior. While this effect individually is large, its final influence upon the system load depends upon the entire system circuit.

The breakdown of the system behavior into component effects, which is afforded by the circuit method, gives a flexible basis for design analyses. In this way, causes, effects, and variables may be isolated and studied in their proper light.

4. *System temperatures*

Figs. 9 and 10 summarize the temperature cycles at the important points in the circuit.

Appreciable differences between glass block and window glass would be expected where the radiation currents were strongest. The results show this for the floor, ceiling, and interior south wall. Still, the absolute magnitude of the differences is small. Moreover, the amplitudes of the interior-surface temperature cycles also are small — small enough to be neglected for some purposes.

These findings pertain only to Phase A of the problem. In the illustrative system, the maintaining of a constant air temperature, along with moderately low convection resistances, serves to hold down the interior-surface temperature amplitudes. Including the directly transmitted radiation will change this, perhaps slightly, for a northern exposure. With a southern exposure, much greater orders of magnitude would be expected.

The comparative times for the peaks of the temperature curves show the interesting effect of radiation and convection circuit branches operating in parallel, for example:

a. The interior south wall, of light construction and directly opposite the window, reaches its peak first.

b. The east and west walls come next in time phase, followed very closely by the floor and ceiling. The floor and ceiling receive more radiation than the end walls, but their capacitance is greater, and this is important in the time lag.

c. The circuit point m, in the middle of the north wall resistance, has the latest peak of all. This is a consequence of the room surfaces *seen* by h being warmed by radiation from the glass several hours before the peak of the temperature wave traveling through the outer wall reaches the inside surface, h. The exchanges of radiation between h and these room surfaces require that h rise in temperature in accordance with the rise in temperature of the other room surfaces, but with a time lag. It will be noted that the temperature at h peaks later in Case II than in Case I. This agrees with the fact that the temperature curve for glass block peaks later than that for single window glass. (See Fig. 5.) A lighter outer wall construction would change the phase relationship of the inner surface temperatures.

Discussion

Useful answers to problems of the type illustrated are needed with a minimum of time and cost. All methods of analysis begin with a definition of the physical system which establishes the thermal resistances, capacitances and sources involved. Possible means of obtaining results include (1) differential equations, (2) numerical methods[5], (3) analogues, (4) circuit calculations, and (5) full-scale experiments.

Comments on these various means follow.

Differential equations are a general and fundamental method, capable of handling transient and aperiodic conditions. If the equations remain linear, and if there are not too many of them to be solved simultaneously, anyone with the necessary mathematical acquaintance can achieve results. This conventional attack becomes unwieldly, however, when confronted with even the relatively simple problem illustrated in this paper.

Numerical methods really are a variation of the circuit approach, wherein the simultaneous equations are solved by arithmetic[5]. This is often the best technique when but a single problem is to be solved.

Analogues are convenient representations of circuits, wherein answers for time-variable cases can be obtained for quite complicated systems, including nonlinear behavior, by laboratory experiments. The deterrent here is the cost of the analogue equipment, which can be justified only by a strong need for extensive use.

Circuit calculations are very convenient for either steady or steady-periodic systems. Advanced analytical techniques, beyond the simple method of this paper, offer extremely powerful and general tools.[6] For the contemplated problems of air-conditioning interest, the method of calculating-machine solutions of circuit equations offers high promise. This can be handled in the ordinary engineering office by outside hiring of computing services, if necessary.

Full-scale experiments are practicable in principle, but they are exceedingly difficult to realize except under controlled laboratory conditions. These also are very time-consuming and present a very lengthy and expensive program if all variables are to be studied over their complete ranges.

Above all, no problem solutions can be better than the physical data upon which they are based.

Present needs are believed to comprise:

1. Improved data on thermal resistances in full-scale rooms. This need is being met largely by current research in the ASHVE Environment Laboratory.

2. Standardized data on design weather conditions, such that circuit inputs can be readily established for all parts of the country. This is one of the goals of ASHVE research.

3. Extension of the glass design data, such that standardized input cycles can be established for all parts of the country and for varied indoor conditions. This can be done with information presently available at the ASHVE Research Laboratory.

4. A careful study of results attainable, costs, time, and practical-application values for the different methods of solving periodic-condition design and analysis problems. Present judgment is that a combination of circuit analysis and an analogue (for the more complicated cases) will be superior for broad and flexible use. This, however, requires further substantiation. An ASHVE cooperative project now under way at the University of California, Los Angeles, is expected to provide valuable guidance.

5. Continuing educational development of circuit methods. This includes recognizing (1) the type of design data which will ultimately be needed for automatic controls, and (2) the time-variable response of equipment.

Recommendations

1. Persons interested in the details of circuit methods should study the Appendices.

2. Phase B and the final conclusion of the illustrative problem should be awaited before attempting complete quantitative judgment of the present results.

3. Extension of circuit principles into problems of automatic control is an inviting prospect which should be developed.

Conclusions

1. Thermal circuit principles and methods of analysis have been demonstrated to yield practical results in the analysis of periodic heat transfer rates and temperatures in air-conditioning systems.

2. The difference between the instantaneous rate of heat gain, by the method used in The Guide, and the instantaneous system load by circuit analysis, (Fig. 6) is believed to demonstrate the practical value and economic savings which can be gained by designing according to circuit principles.

References

1. Heating, Ventilating, Air Conditioning Guide 1952, Chapter 12 — Cooling Load. (Published annually by The American Society of Heating and Ventilating Engineers, New York, N.Y.).

2. Heating, Ventilating, Air Conditioning Guide 1952, Chapter 12 — Cooling Load, Table 9, p. 273).

3. These data are based upon ASHVE Guide 1952, as follows: (*a*) single glass, Table 17, page 291, and (*b*) glass block designated as Type I for Table 24, p. 295. In both instances, the indoor temperature is 75 F with interior surfaces having an emissivity of unity, and the outer surface conductance is 4.0 Btu/(hr) (sq ft) (F deg). Slight cyclic departures from 75 F, or emissivities which are less than 1.0 but still high enough to neglect reflections, are not considered to be important deviations for present purposes.

4. Cooling Load from Sunlit Glass, by C. O. Mackey and N. R. Gay, (ASHVE Journal Section, *Heating, Piping & Air Conditioning*, Vol. 24, No. 8, p. 117, 1952).

5. *Numerical Analysis of Heat Flow*, by G. M. Dusinberre (McGraw-Hill Book Co., Inc., New York 1949).

6. *Matrix Analysis of Electric Networks*, by P. LeCorbeiller (Harvard University Press, Cambridge, 1950).

APPENDIX A

Definition and Interconversion of Corresponding Thermal and Electrical Quantities, with Vector Notation

A specific illustration of the basis for quantitatively interrelating analogous variables in different physical systems will be given. Thermal and electrical equivalents have been chosen for this purpose, but the method applies as well to other cases. Table A-1 gives the fundamental definitions. The vector notation is further explained in the text which follows.

$$N_t = \frac{\text{Magnitude of time unit in thermal circuit}}{\text{Magnitude of time unit in electrical circuit}} \quad \text{..(A-1)}$$

$$N_Q = \frac{\text{Magnitude of quantity unit in thermal circuit}}{\text{Magnitude of quantity unit in electrical circuit}} \quad \text{..(A-2)}$$

$$N_q = \frac{\text{Magnitude of current unit in thermal circuit}}{\text{Magnitude of current unit in electrical circuit}} \quad \text{..(A-3)}$$

$$N_P = \frac{\text{Magnitude of potential unit in the thermal circuit}}{\text{Magnitude of potential unit in the electrical circuit}} \quad \text{..(A-4)}$$

$$N_R = \frac{\text{Magnitude of resistance unit in thermal circuit}}{\text{Magnitude of resistance unit in electrical circuit}} \quad \text{..(A-5)}$$

$$N_C = \frac{\text{Magnitude of capacitance unit in thermal circuit}}{\text{Magnitude of capacitance unit in electrical circuit}} \quad \text{..(A-6)}$$

Following the above six definitions, there are three general relationships which must hold:

1. Defining equation for quantity, $N_Q = N_q N_t$ ....(A-7)
2. Ohm's Law, $N_P = N_q N_R$ ....(A-8)
3. Equivalence of time constants for resistance-capacitance circuits, $N_t = N_R N_C$ ....(A-9)

Thus, there are three equations and six variables, and up to three of the variables may be assigned units as desired. These three chosen variables, however, must not occur all in one equation, because the three equations do not each contain all of the variables. Particular caution must be taken in observing that convention has established the *second* as the principal time unit in electrical terminology, whereas the *hour* is customary in thermal terminology.

Suppose, for example, that the following choices are made:

$N_C = 10^6$, or 1 microfarad = 1 Btu/F deg

$N_R = 10^6$, or 1 megohm = 1 F deg/(Btu/hr)

$N_P = 1$, or 1 volt = 1 F deg

Then,

$N_t = N_R N_C = 1$, or 1 sec (electrical) = 1 hr (thermal)

$N_q = N_P/N_R = 10^6$, or 1 Btu/hr = 1 microampere

$N_Q = N_q N_t = 10^6$, or 10^6 Btu = 1 coulomb

In a practical case, the choice of interconversions should follow economy, experimental convenience, and attainment of the desired experimental accuracy with equipment which may be on hand.

Vector notation is an essential part of the circuit method as developed here. This replaces the calculus and leads to algebraic methods instead of differential equations. Reference to any good text on alternating-current circuits is advised in this connection.

For any circuit branch, the potential and the current are related in terms of the impedance, defined as

Impedance = Potential difference ÷ Current ......(A-10)

Symbolically,

$Z = E/I$ ....(A-11)

The vector impedance of a circuit branch containing resistance and capacitance in series is

$Z = R - j\,X_c$, F deg/(Btu/hr) (A-12)

where j is the operator $\sqrt{-1}$.

Another useful quantity is the admittance, defined as the reciprocal of the impedance, or

$Y = 1/Z = I/E$ ....(A-13)

Admittance is employed in this paper because of its convenience in giving the current in the form

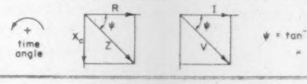
$I = Y\,E$ ....(A-14)

The corresponding thermal notation is

$q = Y\,(\Delta T)$ ....(A-15)

The vector form of a cyclic potential is established from the fact that periodic

Table A-1—Corresponding thermal and electrical quantities and relationships

ITEM	ELECTRICAL		THERMAL	
A. DEFINITIONS				
Quantity	Symbol	Units	Symbol	Units
Time	t	sec	t	hr
Frequency	f	cycles/sec	f	cycles/hr
Charge or quantity	Q	coulombs	Q	Btu
Potential, in general	V		T	
Potential difference	V	volts	ΔT	deg F
Datum potential	V_o, commonly zero	volts	T_o	deg F
Current	I	amperes = $\frac{\text{coulombs}}{\text{sec}}$	q	Btu/hr
Resistance	R	ohms = $\frac{\text{volts potential diff}}{\text{amperes}}$	R	(deg F)/(Btu/hr)
Capacitance	C	farads = $\frac{\text{coulombs charge}}{\text{volts potential diff}}$	C	Btu/deg F
B. SYMBOLS				
Source of constant potential	⊣|‖⊢		⊣|‖⊢	
Source of periodically-varying potential	(~)		(~)	
Sink or "ground"	⏚		⏚	
Resistor	∿∿∿		∿∿∿	
Capacitor	⊣⊢		⊣⊢	
C. USEFUL CIRCUIT RELATIONSHIPS				
Ohm's Law for resistance branch	$V = IR$		$\Delta T = qR$	
Relation between capacitance, potential and current	$C = \frac{Q}{V} = \frac{\int_0^t I\,dt}{V}$ or, $C = \frac{I}{\left(\frac{dV}{dt}\right)}$		$C = \frac{Q}{T-T_o} = \frac{\int_{T_o}^{T} Wc_p\,dT}{T-T_o}$ $= \frac{\int_0^t q\,dt}{T-T_o}$ or, $C = \frac{q}{\left(\frac{dT}{dt}\right)}$	
Capacitive reactance, defined	$X_c = \frac{1}{2\pi fC}$		$X_c = \frac{1}{2\pi fC}$	
Vector notation, with current along real axis	$Z = -jX_c$		$Z = -jX_c$	
Impedance for R-C series branch, defined	$Z = \frac{V}{I}$		$Z = \frac{\Delta T}{q}$	
Magnitude	$\lvert Z\rvert = \sqrt{R^2 + (-X_c)^2}$		$\lvert Z\rvert = \sqrt{R^2 + (-X_c)^2}$	
Time interval by which potential lags current	$\Delta t = \frac{1}{2\pi f}\tan^{-1}\left(\frac{X_c}{R}\right)$		$\Delta t = \frac{1}{2\pi f}\tan^{-1}\left(\frac{X_c}{R}\right)$	
Vector notation	$Z = R - jX_c$		$Z = R - jX_c$	
Admittance for resistance branch	$Y = \frac{1}{Z} = \frac{1}{R}$		$Y = \frac{1}{Z} = \frac{1}{R}$	
Admittance for capacitance branch	$Y = \frac{1}{Z} = \frac{j}{X_c}$		$Y = \frac{1}{Z} = \frac{j}{X_c}$	
Admittance for R-C series branch	$Y = \frac{1}{Z} = \frac{R}{R^2+X_c^2} + \frac{jX_c}{R^2+X_c^2}$		$Y = \frac{1}{Z} = \frac{R}{R^2+X_c^2} + \frac{jX_c}{R^2+X_c^2}$	
Vector sketches			$\psi = \tan^{-1}\left(-\frac{X_c}{R}\right)$	

functions are expressible by a Fourier series, of the form

$$T = a_0 + \sum_{n=1}^{\infty} (a_n \cos n\omega t + b_n \sin n\omega t), \text{ F deg} \quad \text{------------------(A-16)}$$

where

a_o = constant
a_n, b_n = Fourier coefficients
ωt = time angle, radians
n = order of harmonic

The corresponding vector notation, in accord with the sign convention of equation A-12, is

$$T = a_0 + \sum_{n=1}^{\infty} (a_n - jb_n), \text{ F deg} \quad \text{-------- (A-17)}$$

The coefficients a_n and b_n can be established by arithmetical processes by following standardized calculation forms.

Table A-1 summarizes the vector notations needed in this paper.

APPENDIX B

Writing Circuit Equations

Circuit equations are written in accord with Kirchoff's laws for electrical networks. These state that: (1) the currents must balance at any junction point, whereby inflow equals outflow, and (2) the potential differences must balance in going around any closed mesh.

The current-balance method is most convenient for circuits of the present type. In this, the current in any branch is written in terms of the admittance and the potential difference across the branch as

$$q = Y\,(\Delta T), \text{ Btu per hour} \ldots \text{(B-1)}$$

Refer to Fig. B-1 for a current balance at some general junction point x, connected to n other points. Assume current directions as indicated by the arrows. An erroneous assumption will be corrected in the algebraic sign of the answer. Summing the instantaneous currents,

$$q_{1x} + q_{2x} + q_{3x} + \ldots + q_{nx} = q_{xo} \ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(B-2)}$$

The subscript sequence matches the assumed direction of current flow.

For any branch n the current is

$$q_{nx} = Y_{nx}\,(T_n - T_x), \text{ Btu per hr (B-3)}$$

where

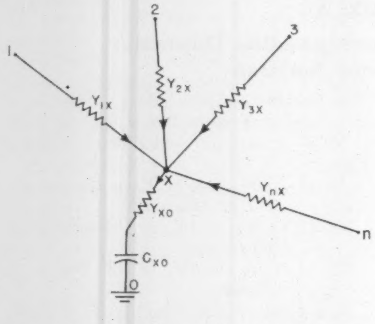
Y = admittance, Btu/(hr)(F deg)
T = potential, F deg

Substituting potentials according to equation B-3 into equation B-2,

$$Y_{1x}\,(T_1 - T_x) + Y_{2x}\,(T_2 - T_x) + Y_{3x}\,(T_3 - T_x) + \ldots\ldots + Y_{nx}\,(T_n - T_x) = Y_{xo}\,(T_x - T_o) \ldots \text{(B-4)}$$

Combining terms,

$$Y_{1x}\,T_1 + Y_{2x}\,T_2 + Y_{3x}\,T_3 + \ldots\ldots + Y_{nx}\,T_n + Y_{xo}\,T_o - (Y_{1x} + Y_{2x} + Y_{3x} \ldots\ldots\ldots Y_{nx} + Y_{xo})\,T_x = 0 \ldots\ldots\ldots \text{(B-5)}$$



B-1—Typical thermal-circuit junction point

Equation B-5 is the basic form applicable to each junction point in a circuit. These equations can be written directly by inspection for any junction point x in the form

$$\sum_{n=0}^{n=n} Y_{nx} T_n - \left(\sum_{n=0}^{n=n} Y_{nx} \right) T_x = 0 \quad \text{---------- (B-6)}$$

There will be one equation for each junction point. The admittances are established from the given physical data, and the potentials are the unknowns. With one equation for each unknown junction-point potential, the problem can be solved. In the present method, all quantities enter in vector notation.

APPENDIX C

Lumping of Circuit Parameters

The solution to any circuit is the answer to a specifically stated problem. How closely this solution may represent the behavior of some original physical system depends upon how well the circuit itself portrays the physical system.

The room of Fig. 2 in the paper is a complicated three-dimensional thermal system. The circuit of Fig. 3 is linear, with unidimensional flow paths; and this is not an exact portrayal of the room. How adequately the approximations involved may serve to yield engineering results is a matter of judgment and experience. Beyond the idealizations stated in the paper, a basic consideration is the lumping into discrete, point-concentrated units which has been imposed on the conduction-path capacitances.[C-1]

Consider, for instance, unidimensional heat conduction across a slab in the steady periodic state. For each small increment of distance along the heat-flow path, there will be an associated small element of thermal capacitance. The capacitance of the slab thus is said to be continuously distributed along the heat-conduction path.

The problem here is analogous to the long electrical alternating-current transmission line with resistance, capacitance, and inductance continuously distributed along the line. This type of problem can be analyzed by a proper application of the calculus; but by lumping the distributed quantities into discrete, point-concentrated units, the problem can be solved with algebra and arithmetic, using vector notation.

The behavior of the lumped line will differ from the behavior of the continuously-distributed line. This difference, however, can be kept inconsequentially small by a *proper choice of the length of line to be lumped.*

For a resistance-capacitance line, it has been shown [C-2] that the calculated current for a lumped line will be within 5 percent of the calculated current for a continuously-distributed line if the length of conductor to be lumped is one-eighth of a wave length. With this increment of line length, the lumped capacitance is connected to ground at the mid-point, and the resistance is divided equally on either side of the grounded capacitance branch.

Applying this to periodic heat conduction, the wave length is

$$\lambda = 2\sqrt{\frac{\pi a}{f}}, \text{ ft} \quad \text{------------------(C-1)}$$

where

a = thermal diffusivity, square feet per hour.
f = frequency, cycles per hour.

Thus, the length of path to be lumped, l, is $(\lambda/8)$ or less, i.e.,

$$l \leq 0.44\sqrt{\frac{a}{f}}, \text{ ft} \quad \text{----------------(C-2)}$$

Note that f varies with the harmonic concerned, so that a compromise is usually advised when several harmonics are involved.

The outer wall of Fig. 2 is represented by the circuit portion between h and T_s in Fig. 3. Calculation and location of the lumped capacitances C_k and C_m are covered in Appendix D. The interior structure capacitances are lumped in single units and grounded as shown in Fig. 3.

References

[C-1] Accuracy of Measurements in Lumped R-C Circuits as Used in the Study of Heat Flow, by V. Paschkis and M. P. Heisler (*Transactions American Institute of Electrical Engineers*, Vol. 63, p. 165-171, April, 1944).

[C-2] *Electromechanical Transducers and Wave Filters*, by W. P. Mason, (D. Van Nostrand Company, New York, 1942, First Edition, p. 62).

The Value of ASHVE Membership

DEAR MEMBERS:

ASHVE membership should be evaluated in terms of what it *pays*, not in terms of what it *costs*. The rewards of membership can neither be measured in actual dollars nor in material or tangible gains alone. Any way one looks at membership, however, it is a good investment, an opportunity and a privilege. I list here a few of the reasons for emphasis.

The excellent technical information our Society publications supply our members is essential to every engineer in our profession and industry. These publications consist primarily of research bulletins, reprints of papers, the monthly JOURNAL, the annual TRANSACTIONS, and the HEATING, VENTILATING, AIR CONDITIONING GUIDE. The cost of the last three to non-members is $19.00 per year.

The information available to our members, from the results of Society-sponsored research reveals opportunities for new applications of engineering services and equipment. *ASHVE research has supplied a very generous share of the engineering knowledge available in our industry.* The Society's work in Codes has improved the safety, performance, and standards of equipment and systems.

Opportunities are provided our members at meetings of the Society and of local Chapters for making contacts with other engineers in the profession and industry and for discussion of mutual problems. At these gatherings you will hear about new applications and new fundamentals that have been developed, and return home relaxed, broadened and inspired. *Any one idea or inspiration or opportunity a member receives from any of the Society's activities may be worth more than the cost of membership over a period of many years.*

Any member who has had an opportunity to serve as a Chapter officer or on a Chapter or Society committee has gained an experience that has benefited and trained him for better service.

There is no way in which a young man can gain a broad understanding of our profession and its allied industries, easier or faster than through Society membership. It adds to his prestige and stature in our broadening field and in his local community. It shows he is interested in his profession. It increases his value to his employer and to himself. There are few ways in which an employer can dignify or create respect for his industry or set a better example to impress on his own employees the technical nature and importance of the industry than through ASHVE membership.

All who are qualified to become members can take pride and satisfaction in belonging to an organization which has accomplished so much in the short span of 60 years. There are few fields of engineering in which a professional Society has exerted as great an influence for good as has ASHVE in heating, ventilating and air conditioning.

If we average the dues received from members and junior members, we find the Society receives an average of $22 per year per member. In 1954 we are budgeted to spend about $52 per member. We can do this only because we have developed other sources of income besides dues. It should be noted, however, that because of this, membership benefits are much greater than if we depended upon dues income alone.

Membership in the Society is a mark of competence, distinction, and achievement because our standards for membership are high.

Probably, the best appraisal of the value of Society membership is given by Life Members whose opinions are quoted:

1. A widely known consulting engineer recalls that attendance at meetings "helped me over many a knotty problem" and introduced "lifelong friends."
2. An educator says, "I gained inspiration and satisfaction by close association in a common enterprise with a group of fine men and I gained a great deal of technical knowledge and a broader view of the whole field of heating and ventilating engineering."
3. Another prominent engineer and research authority states, "It has always been an inspiration to me to be associated with the Society and it has contributed to me far more than I can return to it. *I feel strongly that no young man who wants to develop and be a part of the profession can afford to stay outside of the ASHVE.* He will get large returns on his investment and the more he contributes, the greater will be his return."
4. A prominent engineer and contractor says, "I joined the ASHVE because I recognized the importance of its activities in the future development of the industry. Those who join the Society with the firm determination to do everything they can to help will be well repaid. The local chapter meetings are a most important function of the Society's activities providing as they do the opportunity for closer contact with our fellow members, as well as the place where the various problems peculiar to particular locations may be presented for discussion and clarification. *I never could understand how anyone who expects to make his livelihood from this industry could afford not to be a member of the ASHVE.*"

Every engineer in the profession and the industry will benefit by Society membership. Why not invite that prospective member now? I suggest each member keep a membership application handy.

Cordially yours,

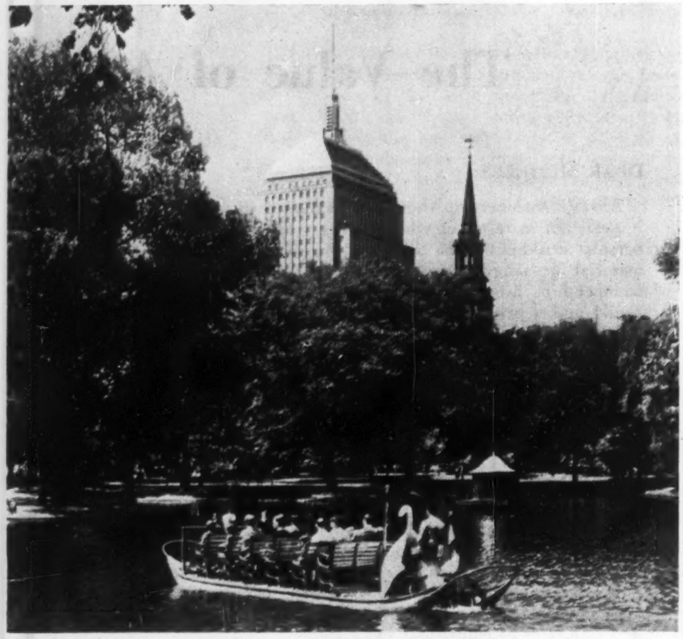
L. N. Hunter

PRESIDENT

Future Comfort Research Amid Shades of Past

Swampscott, Mass.

June 28-30, 1954



Public Gardens with one of the Swan Boats and the John Hancock Building in view

ARE GOOD books your best friends — is your chief interest the doings of the *Fourth Estate* — are you hep on history — do you yearn for the latest technical data and know-how? Then be one of the more than 600 who will gather June 28-30 at the New Ocean House in Swampscott, Mass., just a few minutes away from staid Boston, birthplace of the Society's Patron Saint, Benjamin Franklin. Committees from the Massachusetts Chapter have completed plans for a much-to-be-remembered meeting and an enjoyable stay in tranquil Swampscott, on the North Shore of Massachusetts, which is proud of its modern resorts, and its link to antiquity by proximity to the *hub of history*.

Historical tours and technical research are features of the meeting. Bookworms will find Paradise in Boston Public Library. Its more than one million volumes insures the largest per capita circulation in the United States. See where your country's *Art that preserves all other arts* was born. The *Boston News Letter*, first newspaper in the United States, came into being here in 1704. Take a trip to nearby Concord and stand where Captain Parker told the Minute Men, ". . . if they mean to have war let it begin here." Attend the four technical sessions of the Summer Meeting. Research on future needs and trends in the field of human comfort will be the theme of discussions.

Registration of members and guests starts Sunday, June 27, in the New Ocean House. Society Pres. L. N. Hunter will call the first session to order on Monday morning.

Pleasant diversions are planned for early arrivals. An all-day boat trip to Cape Cod on Sunday will allow several hours for visiting and shopping in quaint Provincetown. Steeped in New England traditions, it retains the look and atmosphere of Colonial days. A musicale and tea is arranged for those who prefer serenity.

At the Welcome Luncheon, Monday noon, Edward Rowe Snow will talk on *New England Legends and Sea Drama*. A native of Winthrop, Mass., and descended from a long line of seafarers, he is author of 17 books on pirates, sea mysteries, and buried treasure.

Monday night will be "Engineers' Night" at the Boston "Pops" Concert, which is similar to the age-old Promenade Concerts of London. Newsmen at the first concert in 1885 were amazed at tables and waiters being in evidence; now the popping of corks is an accepted accompaniment. The musicians are members of Boston's world-renowned Symphony Orchestra which has been selected to replace the National Broadcasting Company Symphony next year. During the summer, these long-hair musicians relax by playing music of a much lighter vein. The "Pops" is famed for its concerts devoted to light-classical and popular selections.

The ladies will hear Arthur Gregorian talk on *Oriental Rugs and the Stories They Tell* on Tuesday morning. A native Persian, he is nationally known for his lectures and articles on this subject.

Climax of the Summer Meeting is the Semi-Annual Banquet, Wednesday night. Toastmaster L. E. Seeley will present the speaker, the Rev. Lex King Souter, Fall River, Mass. Mr. Souter won the National Collegiate Oratorical Contest while a student at William Jewell College in 1929 and his oration was read into the Congressional Record. He is an inspirational speaker and an outstanding civic and spiritual leader.

Those who plan to drive from New York, Philadelphia and the South, should use the Merritt and Wilbur Cross Parkways in Connecticut connecting with Massachusetts Routes 15, 20 and 9 (Worcester Turnpike) to Massachusetts Route 128. From the West, Massachusetts Routes 2 or 9 to 128 should be used. Proceed on Route 128 northbound to exit 19 marked Lynn, Swampscott, Marblehead, and follow the signs or the map sent to all members in April.

PROGRAM — 1954 SEMI-ANNUAL MEETING

THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

New Ocean House, Swampscott, Mass.
June 28-30, 1954

Saturday — June 26

10:00 a.m. Council Meeting
1:30 p.m. REGISTRATION *(Lobby Floor)*

Sunday — June 27

9:00 a.m. Buses leave for Rowe's Wharf, Boston. Boat for Provincetown sails at 10:00 a.m. returning at 8:00 p.m. Picnic lunch furnished — refreshment facilities available on boat. Several hours in Provincetown for sight-seeing.
1:30 p.m. REGISTRATION *(Lobby Floor)*
2:00 p.m. Musicale and Tea
2:00 p.m. Motor trips to nearby historical points

Monday — June 28

9:00 a.m. REGISTRATION *(Lobby Floor)*
9:30 a.m. FIRST TECHNICAL SESSION *(Ballroom)*
- Physiological Responses to Sudden Changes in Atmospheric Environment: Studies of Normal Subjects, Obese, Hyperthyroid and Hypothyroid Patients, by Tohru Inouye, F. K. Hick, M.D., R. W. Keeton, M.D., and Lionel Bernstein, M.D.
- A Rapid Heat Meter Thermal Conductivity Apparatus, by J. D. Verschoor and Ada Wilber
- Irradiation of Vertical and Horizontal Surfaces by Diffuse Solar Radiation from Cloudless Skies, by G. V. Parmelee

12:15 p.m. WELCOME LUNCHEON *(Dining Room)*
- Speaker: Edward Rowe Snow, Author
- Subject: New England Legends

1:30 p.m. GOLF TOURNAMENT *(Tedesco Country Club)*
- Research, Eichberg and Paul Bunyan Cups — 18 Hole Medal Play

1:30 p.m. Deep Sea Fishing trip — Swimming at beach
2:00 p.m. Committee Meetings
7:30 p.m. Boston Pops Concert (popular and light classical music) Arthur Fiedler conducting

Tuesday — June 29

9:00 a.m. REGISTRATION *(Lobby Floor)*
9:30 a.m. SECOND TECHNICAL SESSION *(Ballroom)*
- Characteristics of Downward Jets of Heated Air From a Vertical Discharge Unit Heater, by Linn Helander, S. M. Yen and L. B. Knee
- Computing Temperatures and Velocities in Vertical Jets of Hot or Cold Air, by Alfred Koestel
- Sound-Pressure Levels and Frequencies Produced by Flow of Water Through Pipe and Fittings, by W. L. Rogers
- *Computation Charts and Theory for Rectangular and Circular Jets, by H. G. Elrod, Jr.

10:00 a.m. Ladies Party. *Oriental Rugs and the Stories They Tell*, by Arthur Gregorian
1:30 p.m. Long-Range Planning Committee
1:30 p.m. Nominating Committee Meeting
1:30 p.m. Boat and Bus Trip to Salem and Gloucester
1:30 p.m. Historical Tour to Boston
2:00 p.m. Committee Meetings
2:00 p.m. Swimming at beach
7:00 p.m. New England Shore Dinner
8:30 p.m. Film presentation — informal dancing in the Ballroom

Wednesday — June 30

9:00 a.m. REGISTRATION *(Lobby Floor)*
9:30 a.m. THIRD TECHNICAL SESSION *(Ballroom)*
- Filtration of Microorganisms from Air by Glass Fiber Media, by H. M. Decker, J. B. Harstad, F. J. Piper and M. E. Wilson
- Effects of Room Size and Non-Uniformity of Panel Temperature on Panel Performance, by L. F. Schutrum and J. D. Vouris
- Performance Data on Ceiling Panel Heating and Cooling, by R. J. Mindak and I. B. Fieldhouse
- Cooling Load from Sunlit Glass and Wall, by C. O. Mackey and N. R. Gay

10:00 a.m. Ladies Visit to noted North Shore Gardens
2:00 p.m. FOURTH TECHNICAL SESSION *(Ballroom)*
- Cooling Studies in a Research Home, by W. S. Harris and P. J. Waibler
- Analogue Computer Analysis of Residential Cooling Loads, by T. N. Willcox, C. T. Oergel, S. G. Reque, C. M. toeLaer and W. R. Brisken
- The Operating Cost of Residential Cooling Equipment, by S. F. Gilman, L. A. Hall and E. P. Palmatier
- Adjournment

7:00 p.m. SEMI-ANNUAL BANQUET *(Main Dining Room)*
- Toastmaster: Past Pres. Lauren E. Seeley
- Speaker: Rev. Lex King Souter, Minister, First Congregational Church, Fall River, Mass.

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*Presented by title.

Method of Choosing Location of, Financing and Conducting Meetings of the Society

Resolved: That inasmuch as the Annual and Semi-Annual Meetings of the Society come under the jurisdiction of the Council, the following rules governing the handling of such meetings be adopted by the Council and published in the JOURNAL of the Society at least twice during every year, preferably just prior to each meeting.

1—The Council will select the city in which the Annual or Semi-Annual Meeting is to be held, giving due consideration to the invitations received from Chapters or members as well as to the advisability of so distributing those meetings as to make them of the greatest advantage to the general membership, and to reduce as far as possible the expense of members attending.

2—That an appropriation be made to cover the entertainment or local expenses, incurred in connection with the meeting, and the regular meeting expenses to be taken care of by the General Fund of the Society in the regular way.

3—That no registration fee or compulsory obligations of any nature be imposed on members or guests.

4—That the purchase of tickets for banquets or for any other form of entertainment that may be provided be entirely voluntary.

5—That the grouping of features and the sale of tickets for group features be discouraged.

6—That the raising of funds from manufacturers of heating apparatus be discouraged.

7—That the display of samples, or of literature, advertising the product of any manufacturer in any way, shape or form, be not permitted at the booths, registration desk, or in or about the meetings.

8—That the distribution of trade papers be entirely at the discretion of the committee in charge.

9—That the local Chapter or local members be empowered to form a General Committee with such sub-committees as may be required to handle the details of transportation, hotel accommodations, entertainment, finance, etc., and that this General Committee be requested to confer frequently with the Council, through the Executive Secretary of the Society, and to make frequent reports on progress in connection with the various matters being handled by them.

10—That the arrangements of elaborate and costly entertainment features be discouraged.

Adopted at Council Meeting, January 29, 1926.

JOURNAL SECTION

Planning Research Programs

By R. S. Dill, *Chairman*

ASHVE Committee on Research

THE SOCIETY'S Laboratory and three cooperating institutions have contributed five research papers for the Semi-Annual Meeting at Swampscott, Mass., June 28. These reports cover a wide range of subject matter all of which will be helpful to engineers in everyday practice.

The cooperation and advice of the respective Technical Advisory Committees have been an important factor in developing the programs of investigation, and at recent meetings of several Technical Advisory Committees some ambitious plans were revealed for future research at the Laboratory and in cooperating colleges.

There are 20 Technical Advisory Committees now at work on projects that are highly important to future engineering design and application but only a few will be mentioned at this time.

Air Distribution Research will be continued at Case Institute of Technology, Kansas State College and Michigan State College. A new sub-committee will consider the special problems of high velocity air distribution. The Chairman is L. R. Phillips and the other committee members are S. F. Gilman, F. B. Holgate, W. W. Kennedy, J. N. Livermore.

The results of a Pitot tube study of available literature made by the Laboratory staff members brought out the following points:

1. Code requirements as to static hole size, traverse points and accuracy in the measurement of velocity pressure restrict the use of tubes smaller than standard for flow measurements in small ducts.

2. It appears that Pitot tubes of proportions other than those specified in the Code for Testing Centrifugal and Axial Fans used with a different traverse schedule could yield the data required to give fan performance.

3. Data are lacking as to proper scale factors relative to duct size and also with respect to aerodynamic effects when tubes are close to duct walls.

This study was undertaken at the request of the *National Association of Fan Manufacturers.*

The Industrial Environment Committee has proposed a study on pressure loss through flexible conduits. Continuation of the work on local exhaust ventilation is in progress at the University of Pittsburgh.

The Committee on Hot Water and Steam Heat will expand its work in the field of venting hot water heating systems in proposed research at the University of Illinois. Compilation of a bibliography on high temperature hot water heating is planned as well as a research project on air elimination which will deal with the fundamental problems of water velocity, temperature, pressure, origin of gases and disposition of units. Further exploration of noise in piping systems and further work on metastable conditions in boilers will be conducted at Northwestern University.

A joint research project on pulsation and resonance in oil and gas flames is being undertaken by ASHVE, *AGA* and *OHI*. Work will be started shortly at Battelle Memorial Institute, Columbus, Ohio. A steering committee of seven members includes two representatives of each of the participating organizations with H. R. Limbacher as Chairman. The steering committee recommended the use of facilities at Battelle and on May 4 the Technical Advisory Committee on Combustion of ASHVE authorized the activation of the program. Periodic progress reports will be made to committee members.

One of the immediate and pressing problems in carrying on work at the Research Laboratory is obtaining trained personnel to initiate some of the pending projects and the Committee on Research will welcome suggestions on sources of manpower.

PRES. L. N. HUNTER VISITS PACIFIC COAST

British Columbia Honors President Hunter

President Hunter with C. W. Leek, president of British Columbia Chapter

S. C. Gale, vice president of British Columbia Chapter, explains totem pole to President Hunter

Pres. C. W. Leek presided at the regular April dinner meeting of the British Columbia Chapter.

ASHVE Pres. L. N. Hunter, Johnstown, Pa., was guest speaker for the evening. After a talk on ASHVE activities, President Hunter addressed the chapter on the *Rating of Heating Boilers.* This speech covered the various codes in effect to rate heating boilers and their scope. The lengthy discussion period which followed indicated the interest taken in Mr. Hunter's talk.

As a remembrance of President Hunter's visit to Vancouver, a hand carved Indian totem pole was presented to him by Vice Pres. S. C. Gale.

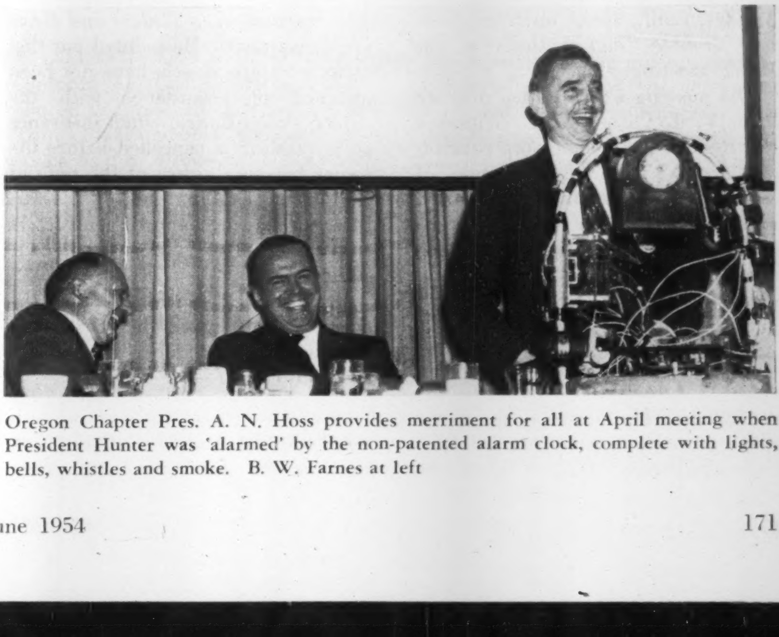
E. H. Norton spoke briefly on the proposed Smoke By-Law. The Chapter was invited to appoint an advisory committee and to study the proposed by-law, and the matter was referred to the Board of Governors. Attendance 51. Attendance ratio* 0.62.

Hoss 'Alarm' Alerts President Hunter

Society Pres. L. N. Hunter, Johnstown, Pa., was guest speaker at the April meeting and gave a very informative two-part talk on the Society's obligation to its members and *The Rating of Heating Boilers.*

Reports were read by J. E. Finkbeiner, secretary, Dick Blankenship, treasurer, and A. N. Hoss, chapter president, read the reports from the committees.

B. W. Farnes installed the new officers as follows: *President* — E. E. Kelly; *Vice-President* — Dick Blankenship; *Secretary* — K. N. Flocke; *Treasurer* — W. B. Hayes; *Board of*



Oregon Chapter Pres. A. N. Hoss provides merriment for all at April meeting when President Hunter was 'alarmed' by the non-patented alarm clock, complete with lights, bells, whistles and smoke. B. W. Farnes at left

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*Note: The attendance ratios shown represent the membership attendance divided by the chapter membership. These ratios will be useful as a partial indication of interest shown by local chapter members in various types of subjects programmed by the various chapters and may be useful in deciding on subjects for chapter meetings.

Governors: G. G. Van Alst, A. N. Hoss, W. R. Pindell. President Kelly presented Mr. Hoss with a pair of bronze bookends with the Society's emblem inscribed in recognition of his term in office.

Who Stole the Ding Dong—Who Stole the Bell was a choral plea rendered by a group of chapter past presidents in the hopes that the missing Swiss meeting bell will soon be returned.

Earlier in the day, President Hunter was a guest at a pre-meeting luncheon attended by incoming and outgoing officers, the board of governors, and nine past presidents of the chapter. Attendance 83. Attendance ratio 0.49.

Oregon Chapter Officers installed at April meeting (*l. to r.*) G. G. Van Alst, A. N. Hoss, Board of Governors; W. B. Hayes, treasurer; E. E. Kelly, president; W. R. Pindell, Board of Governors; Dick Blankenship, vice president; and K. N. Flocke, secretary

OSC Student Branch Makes Portland Field Trip

The Oregon State College Student Branch of ASHVE made a trip to Portland on March 4 where they visited typical field installations and attended the monthly meeting as guests of the Oregon Chapter at the Heathman Hotel.

The trip was sponsored by the Oregon Chapter under the direction of O. T. Jacobson, with R. C. Chewning, T. E. Taylor and Dick Blankenship acting as guides to the installations visited.

Mr. Chewning explained the operation and control of a heat pump as applied to a newspaper building, using the Oregonian Building for his tour, and pointed out the features of a large heat pump application.

Mr. Taylor directed the inspection of the Good Samaritan Hospital, pointing out the control features of a steam system and indicating the special mechanical equipment features of a hospital.

A warehouse converted into office space was utilized by Dick Blankenship to point out one method of zone control for a building. The new offices for Willamette Iron and Steel Co., under construction, featured a hot water heating system and a vapor compression cooling system.

Summary of Chapter Meetings

• *ARIZONA*: Maron Kennedy, sales engineer, York Corp., Los Angeles, Calif., spoke on *High Pressure Double Duct Systems* at the March meeting.

The meeting was presided over by Pres. V. J. Carns. W. L. Whitaker reported for the membership committee; and W. A. Biddle, chairman of the legislative committee, reported on a bill pending in the State Legislature creating an Arizona Department of Public Works, which provides for approval of plans for all public buildings. Attendance 40. Attendance ratio 0.52.

• *ARKANSAS*: The feature of the evening was a talk by M. L. Blair, chief inspector, Boiler Inspection Division, Department of Labor, State of Arkansas. Mr. Blair spoke on *The Installation of Boilers and Heating Equipment.* He pointed out that many pressure vessels have not been installed in accordance with the *ASME Boiler Code.* Often insurance on a building is cancelled before the owner becomes aware of the type of equipment in his building. Mr. Blair urged mechanical contractors and engineers to eliminate non-code equipment.

Pres. R. E. Blaylock called the meeting to order, and the guests were introduced. Attendance 34. Attendance ratio 0.42.

• *ATLANTA*: Pres. J. G. Croley presided at the April dinner meeting.

Business of the meeting included the appointment of J. W. Borum as liaison representative to the *Georgia Society of Professional Engineers.* Also, reports were read by W. M. Garrard on future events, and Charles Sockwell, Jr., chairman of the nominating committee, on nominations presented. Appointment of the auditing committee was announced as follows: R. L. Beals, C. B. Cole, and D. M. McRae.

Donald Vance, vice president of the Korfund Co., spoke on *Vibration and Noise Control for Air Conditioning Equipment.* Attendance 55.

• *BALTIMORE*: The meeting was called to order by Pres. H. D. Glaser. A nominating committee was elected as follows: W. P. Flanigan, M. E. Eusey, Jr., J. H. Baker, S. Y. Smith, and J. F. Grice.

F. M. Hewitt introduced the speaker at the March meeting, E. G. Carrier, senior sales engineer, Carrier Corporation, Philadelphia, Pa., who spoke on *The Psychrometric Chart and Its Use.* He also illustrated on a blackboard several formulas for determining information necessary to make up a psychrometric chart. He then proceeded to go through the basic steps in the compilation of the chart from the information available. Attendance 40. Attendance ratio 0.36.

• *CENTRAL NEW YORK*: The feature of the meeting was a symposium entitled, *The Functions and Responsibilities of an Engineer, a Manufacturer's Representative and a Heating Contractor.* F. D. Putnam introduced the panel members, J. H. Carpenter, moderator, Leigh St. John, engineer, J. W. Stevens, manufacturer's representative, and W. F. Hasselberger, heating contractor. Each member of the panel presented his opinion of the responsibilities and functions his occupation entails in completing a satisfactory air conditioning job.

Pres. C. R. Acheson called the March meeting to order, and the minutes of the previous meeting and the treasurer's report were read and approved. Attendance 65. Attendance ratio 0.41.

• *CENTRAL OHIO*: Pres. N. T. Hess called the April dinner meeting to order.

Chairman of the civic betterment committee, R. S. Curl, reported on an offer by The Ohio Fuel and Gas Co. to hold schools and meetings for users, installers, and engineers in the application of gas firing equipment for jobs requiring in the excess of 1000 Btu.

F. M. Johnson, sales manager, air conditioning division, Surface Combustion Corp., gave an interesting talk on *Moisture Problems.* Attendance 41. Attendance ratio 0.30.

• *CINCINNATI*: At the April meeting, A. W. Edwards, who has been named General Chairman of the Committee on Arrangements for the 62nd Annual Meeting, for which the Cincinnati Chapter will be host in January 1956, announced the committee chairmen as follows: *banquet*—E. A. Sobolewski; *entertainment*—C. P. Krantz; *finance*—E. W. McNamee; *ladies*—R. C. Beineke; *publicity*—R. G. Anderson; *reception*—F. W. Wilson; *sessions*—H. W. Moore; *special events*—J. J. Bechtol; and *transportation*— N. A. Frankel, Jr. H. E. Sproull was appointed honorary chairman and H. E. Russell, vice chairman.

Committee reports were read, and discussion of the headquarters for the 1956 Annual Meeting followed. Attendance 49. Attendance ratio 0.40.

• *CINCINNATI*: The March meeting was presided over by Pres. R. C. Beineke. Arno Gerdsen, secretary, read the minutes of the previous meeting, and W. H. Rieger announced the speaker for the April meeting. The membership committee report was given by K. B. Little.

President Beineke appointed the following nominating committee: J. J. Bechtol, chairman, K. B. Little, and E. W. McNamee.

The speaker of the evening was Clarence Carl of the Atomic Energy Commission. Attendance 57. Attendance ratio 0.37.

• *CONNECTICUT*: R. B. Sweet introduced American Magician's Association President Bill Greenough, and Tony Patricelli, his assistant, who spoke on *The Magic of Sales Promotion in the Engineering Field,* with the aid of chicks, snakes, cards, lights, magic boomerangs, and a host of other paraphernalia.

Pres. G. F. Nieske announced that a committee comprised of Walter Heywood and J. J. Morro is working on an air conditioning code for the City of Waterbury. Jack Osborn and C. W. Freeman were appointed as auditors, and E. C. Marsden and P. D. Bemis as tellers.

Election results were as follows: *president*—C. L. L'Hommedieu; *vice-president*—E. J. Hoagland; *secretary*—Walter Heywood; *treasurer*—Carl Wahnquist, Jr.; *board of governors*—G. F. Nieske, Fritz Honerkamp, and J. D. Pierce. Attendance 32. Attendance ratio 0.26.

• *GOLDEN GATE*: Pres. J. E. Murray called the April meeting to order, and the minutes of the March meeting were approved as read. Reports were presented by H. R. Scandrett for the finance committee, and by A. D. Sheere for the publicity committee. A. T. Bloxham then reported on the local building code revision. R. D. Knowles, Chapter representative on the Chapters Conference Committee, gave an interesting report on the 60th Annual Meeting in Houston.

John E. Haines

Guest speaker for the evening was J. E. Haines, Minneapolis, Minn., Society first vice president, who gave a talk entitled, *The Next Ten Years.* Mr. Haines outlined the stupendous growth of the Society and the heating, ventilating and air conditioning industry in the last ten years, and predicted progress during the next decade would exceed that of the last ten years. Attendance 73. Attendance ratio 0.31.

• *INLAND EMPIRE*: Pres. G. M. Dieter appointed M. A. Clerc, chairman; Bruce Campbell, and J. L. Harvey, as tellers of election. Nominating Committee Chairman L. E. Marque announced the slate of candidates.

A panel consisting of Max Tonn, W. R. Elam, S. R. Stillwell, and J. L.

Harvey, with J. A. Doyle as moderator, answered questions on general engineering problems which the members submitted in writing. Mr. Doyle directed each question to the panel member best qualified to answer. The ensuing discussion was thoroughly enjoyed by all. Attendance 26. Attendance ratio 0.65.

• *IOWA*: The March meeting was a joint gathering of the Iowa Section of the *ASME* and the mechanical, electrical, railway and agricultural sections of the *Iowa Engineering Society*. The meeting was called to order by G. V. Yarger, of the *Iowa Engineering Society*, who turned the program over to Chapter Pres. J. F. Sandfort.

W. K. West, manager of agricultural application sales of Delco Products Division, General Motors Corp., Dayton, Ohio, was the guest speaker. Mr. West discussed the application of electric motors in the operation of farm machinery and equipment, pointing out the great potential for use of electrical power in the agricultural field. He particularly emphasized the increase in farm production which can result from the use of electrically driven crop dryers. Attendance 30.

• *KANSAS*: Dinner at the Broadview Hotel preceded the March meeting of Kansas Chapter.

Program Chairman Charles Yoe introduced the speaker, F. G. Meyers, chief engineer, Marlo Coil Co., St. Louis, Mo. His subject was *Calculated Versus Actual Residential Cooling Load, Operating Data on Packaged Type Evaporative Condensers, Air-Cooled Condensers, and Water Condensers for Home Air Conditioning Units.*

Pres. R. L. Pennington announced the formation of a new water conservation committee, under the chairmanship of E. G. Fahnestock. Attendance 41. Attendance ratio 0.36.

• *KANSAS CITY*: *ASRE* members were the special guests at the April meeting.

Pres. G. H. Stoffer congratulated the membership committee, under the chairmanship of P. A. Moreno, for this year's membership drive. L. A. Heaven, entertainment committee, reported on future plans; W. E. Howarth reported for the nominating committee; and L. T. Mart spoke on the January Council meeting in Houston.

F. K. Ladewig, program chairman, introduced the guest speakers on the following subjects: Conrad Wilson, Kansas City Power and Light Co., on *Power for Air Conditioning;* Melvin Hatcher, director of the Kansas City Water Dept., on *Air Conditioning and Its Effect on the Water Department;* and H. E. Degler, technical director of The Marley Co., Inc., on *Water Cooling Equipment for Refrigeration and Air Conditioning.* Attendance 120. Attendance ratio 0.32.

• *MANITOBA*: J. F. Bertram introduced the speaker at the March meeting, C. M. Wilson, general sales manager, Anemostat Corporation of America, New York, N. Y. Mr. Wilson spoke on *Fundamentals of High Velocity Air Distribution.*

At the business meeting Pres. A. K. Piercy welcomed members and guests. Minutes of the previous meeting were read and approved, and it was decided to forward a congratulatory message to the newly created South Carolina Chapter on the occasion of its Charter Meeting. Attendance 20.

• *MASSACHUSETTS*: The board of governors meeting was followed by the April Chapter meeting.

John Bonner and M. I. Kishler were appointed election tellers by Pres. A. L. Hare.

President Hare announced the appointment of a committee to study a petition for joint sponsorship of a scholarship to be given by the Massachusetts Chapters of ASHVE and *ASRE* to a Massachusetts Institute of Technology engineering graduate in the field of heating, ventilating, and air conditioning.

The membership was asked to cooperate with the Semi-Annual Meeting Committee on Arrangements under the chairmanship of R. T. Kern.

J. M. Means presented William Peters, Anemostat Corp. of America, who spoke on high velocity, air distribution. Attendance 51.

• *MASSACHUSETTS*: Pres. A. L. Hare called the meeting to order and in the absence of the treasurer read the financial report. He then announced that a new Chapter had been formed in South Carolina, and it was voted to send a telegram of congratulations for the Charter Meeting. D. M. Archer, chairman of the nominating committee, presented the committee's recommendations for officers for 1954-55.

The speaker of the evening, H. A. Lockhart, chief engineer, Bell & Gossett Co., Morton Grove, Ill., was introduced by Vice Pres. G. W. Sprague. Mr. Lockhart spoke on *Problems of Hot Water Heating Systems.* Attendance 54.

• *MICHIGAN*: The annual Ladies Night and Past Presidents Night was held at the Engineering Society of Detroit. Pres. R. H. Oberschulte introduced 16 past presidents of the Chapter, and G. W. Akers presented a Past President's pin to the newest Past President, C. A. Strand.

A Life Membership Certificate was presented in absentia to J. W. Snyder by President Oberschulte.

Program Chairman E. F. Glanz introduced the speaker, D. S. Leonard, commissioner, Department of Police, City of Detroit, who spoke on *The Responsibilities of Citizenship*, urging the acceptance of citizenship responsibility in availability for jury duty and public office. Attendance 66. Attendance ratio 0.26.

• *MINNESOTA*: Guest speaker for the evening, J. W. May, technical director, American Air Filter Co., Louisville, Ky., spoke on the selection and application of air filters.

Pres. V. E. Pearson gave recognition to five guests from Paris, and

Michigan Chapter Officers for 1953-54 (*standing*) D. S. Falk, secretary; J. N. Livermore, treasurer; (*seated*) R. H. Oberschulte, president; E. F. Glanz, vice president

to chapter members who faithfully come from distant points.

Nominating Committee Chairman D. M. Forfar presented the slate of candidates for May elections. E. F. Snyder, Jr., expressed the importance of maintaining continuity in the selection of officers for the chapter in order to have a smooth running organization. Attendance 109.

• *MISSISSIPPI*: At the Chapter's March meeting, the minutes of the previous meeting were read and approved with a slight correction and the treasurer, T. E. Stepan, presented his report. Burt Lomax, Chapter member of the Chapters Conference Committee, presented a review of the proceedings at the Annual Meeting in Houston.

R. A. Craig introduced the speaker, David Lawson of the Sporlan Valve Co. Mr. Lawson spoke on *Theory and Operation of Thermostatic Expansion Valves*, and illustrated his talk with slides. Attendance 38.

• *MONTREAL*: J. E. Haines, Minneapolis, Minn., Society first vice president, was the guest of honor at the Chapter's March meeting. Mr. Haines made a few brief remarks on the work that is being done and the plans that are being made by the Society, including expansion of staff to meet the expansion of membership, and increased research activities.

Roger des Trois Maisons introduced the speaker, William Andrews, assistant manager, Ross Engineering of Canada, Ltd., Montreal, Que., who showed a film entitled *Corrosion in Action*. The film presented the fundamental principles of corrosion, its causes and how to combat it. In a short talk Mr. Andrews explained how the corrosion problem was dealt with in heating and air conditioning installations.

The following officers were elected for 1954-55: *president* — D. L. Lindsay; *vice president* — R. J. Ker; *secretary* — S. R. Plamondon; *treasurer* — W. E. Jarvis; *board of governors* — B. J. Horsburgh, G. N. Martin, H. G. S. Murray, R. E. J. Layton, and Robert Clapperton. Attendance 101.

• *NORTH JERSEY*: Election of new officers for 1954-55 was a feature of the April meeting. Those elected were: *president* — H. M. Patrick; *vice president* — C. H. Smith; *secretary* — W. C. Kruse, Jr., *treasurer* — M. C. Christesen; *board of governors* — H. P. Morehouse, G. C. Norman, S. H. Nitzberg, and F. H. Faust.

H. M. Patrick introduced the speakers of the evening, W. G. Cox, manager, products and sales planning, and D. W. Lynch, design engineer and manager of engineering, both of the Weathertron Dept., General Electric Co., Bloomfield, N. J. The topic for discussion was *The Heat Pump*, in which an explanation of the general design principles of the heat pump was given. Detailed information was also presented regarding the cost of operation in various types of structures, and comparisons made with other air conditioning and heating systems. Attendance 79.

• *NORTH TEXAS*: After a discussion by E. V. Marshall of Chance Vought on *Air Conditioning High Speed Aircraft*, Chapter members learned that their problems were minor compared to those faced by the aircraft air conditioning engineer. Interest of the group was shown by the quality of questions asked.

An announcement was made about the Fort Worth meeting to be held at Midway Airport in May.

Pres. M. W. Brown will appoint a committee to study ways and means for establishing a Giesecke Memorial Fund. Attendance 89. Attendance ratio 0.39.

• *NORTHEASTERN OKLAHOMA*: Pres. R. W. Winget called the meeting to order at the University of Tulsa Student Union Building. Guests were introduced, and the minutes of the February meeting were read and approved.

A. C. Shelley introduced the speaker, Jack Willis, Herman Nelson Division of the American Air Filter Co., who gave a very interesting talk on the use of fan curves in the selection and application of centrifugal fans. Attendance 30. Attendance ratio 0.53.

• *NORTHERN OHIO*: Philip Cohen, sales manager, Air Handling Apparatus, Sturtevant Division, Westinghouse Electric Corp., Boston, Mass., was the speaker at the March meeting. Mr. Cohen spoke on fan manufacturing, production, and design problems. A question and answer period followed his talk.

Pres. J. M. Black presided over the meeting, and program chairman H. R. Canoyer announced that the April meeting would feature a talk on pipe corrosion by Dick Hayman of L. D. Betz Co. The following were elected to the nominating committee: Lester T. Avery, R. L. Byers, and L. C. McClanahan. Attendance 64.

• *NORTHERN PIEDMONT*: Program Chairman G. H. Ficken announced the program for the evening which consisted in the showing of a film, *Corrosion in Action*, through the courtesy of the International Nickel Company.

The March meeting was called to order by Pres. R. B. Crosland and minutes of the February meeting were approved as read. President Crosland presented by-law changes suggested by J. E. Hart to clarify the present by-laws. The proposed changes were approved. Attendance 27. Attendance ratio 0.43.

• *OKLAHOMA*: Pres. F. X. Loeffler, Jr., announced the selections of the nominating committee and further nominations were made from the floor.

F. J. Nunlist, Jr., vice president, Mueller Climatrol, Milwaukee, Wis., spoke on *Perimeter Heating and Cooling*, presenting a comprehensive report on the results of tests conducted by the National Warm Air Research Advisory Committee of which he is a member. Attendance 58. Attendance ratio 0.50.

• *ONTARIO*: Pres. N. W. Kingsland requested the Chapter to observe a period of silence in memory of E. Holt Gurney, late esteemed member and past president of ASHVE.

Officer candidates for nomination were announced by William Philip, who is working with H. B. Jenney and F. G. Ewens on the nominating committee. President Kingsland listed F. D. Ledgett, chairman, and R. A. Ritchie as auditors for the coming year.

R. A. Lane, whose thesis on *The Utilization of Solar Energy* won the Ontario Chapter's award for the best University of Toronto student paper on heating, ventilating and air conditioning, was introduced by Mr. Ewens. The runners up were L. F. Bolger on *Cabin Pressurization in Aircraft*, and J. H. Edwards on *Radiant Heating for Buildings.*

C. J. Bootes asked members to submit news items to K. E. Gould, editor of the new monthly Ontario Gazette, containing local news of Chapter activities.

A panel of speakers presented industrial problems and their solutions: *An Indirect Heater Problem* by F. J. Broderick, district sales manager, S. A. Armstrong Ltd.; *Solution of a Coil Freeze-Up Job* by L. A. Childs, the Aerofin Corp., Syracuse, N. Y.; *How to Pipe Up and Control Three Boilers* by Don Parrish, H. H. Angus and Associates Ltd.; and *An Oil Burner Headache* by W. J. Wilkinson, managing director, Power Plant Contractors. Attendance 101. Attendance ratio 0.73.

• *PACIFIC NORTHWEST*: The March meeting was a joint one with the local *ASRE* group. Special guest of the evening was A. J. Hess, Council member of ASHVE and also president of the *ASRE*, who made a few brief remarks. Mr. Ball, president of the local *ASRE* group, introduced Bert Robinson, who outlined arrangements for the forthcoming *ASRE* Semi-Annual Meeting to be held in Seattle.

J. W. McElgin, chief engineer, John J. Nesbitt Corp., Philadelphia, Pa., spoke on *Trends in Classroom Ventilation.* The talk was followed by a question and answer period. Attendance 57.

• *PHILADELPHIA*: Pres. C. F. Dietz called the March meeting to order and introduced four new Chapter members. G. E. Klapper announced the coming annual golf outing to be held in June.

The speaker of the evening, Samuel Miller, John J. Nesbitt Co., Philadelphia, Pa., was introduced by A. M. Robertson. Mr. Miller presented a very interesting discussion on *Trend and Design of Unit Ventilating Systems.* The talk was illustrated with slides and was followed by considerable discussion. Attendance 112. Attendance ratio 0.22.

• *PITTSBURGH*: Nominations for officers were read by Pres. C. H. Schneider at the April meeting.

A 2½ hour tour of the new Alcoa Building from basement to tower was the feature of the evening. Four groups met at the 7th floor to see color movies of the complete erection of the building. Attendance 70.

• *SACRAMENTO VALLEY*: Society First Vice President J. E. Haines, Minneapolis, Minn., spoke on *The Next Ten Years*, giving a brief resume of business growth from 1943 to 1953, and predicting a decade of economic expansion.

A short dissertation on the *Air Conditioning of Swine* was given by F. E. Hawley.

Prof. Edwin Weinberg, technical education department of the Sacramento State College, was advised that the Chapter would gladly assist in setting up an engineering curriculum at the institution.

Decision was made to join the *Engineering Joint Council* with Pres. E. C. McKinsey and L. A. O'Meara as appointed delegates. President McKinsey appointed the nominating committee as follows: D. C. Benbow, V. W. Eilers, Thomas Chinn, L. L. Mullins, and Arthur Roth. Attendance 51. Attendance ratio 0.46.

• *ST. LOUIS*: Society First Vice Pres. J. E. Haines, Minneapolis, Minn., spoke on *The Next Ten Years* at the April meeting. Showing the great strides made in the last decade in gross national product, production of power, population, construction, and in the air conditioning and heating industry, Mr. Haines predicted a future decade of tremendous advancements in the same industries, with atomic energy, solar energy for heating, automobile air conditioning, and plastics in the construction industry.

Reports were read by G. B. Pattiz, chairman of the blood bank committee; and W. P. Norris, on the nominating committee. J. I. Levenhagen announced that there had been a chapter membership net gain of twenty in the last year.

Pres. H. C. Sharp advised that three Chapter members were on national committees: L. L. Hamig, Technical Advisory Committee on Weather Data; B. L. Evans, Chapter Relations Committee; and G. W. F. Myers, Executive Committee. Attendance 75.

• *SOUTH TEXAS*: Walter Rolfe, of Golemon & Rolfe, architects, made his recent trip to South America the basis for the talk he gave before the Chapter's March meeting. Mr. Rolfe gave vivid descriptions of the climate, architecture, customs and attitudes he encountered in the various places he visited, which included Panama, Lima, Santiago, Buenos Aires, and Sao Paulo. He stated that in the way of architecture he found much of interest, the trend being toward the unusual. He observed very few air conditioning installations, the most being found in Puerto Rico. It was his opinion that South America offers much opportunity for the growth of air conditioning if the economic situation can be corrected.

At the business meeting which preceded the talk, the minutes of the February meeting and the treasurer's report were read and approved. The following members were elected to serve on the nominating committee: H. W. Broadwell, J. A. Poole, C. C. Quin, and R. J. Salinger. Attendance 57. Attendance ratio 0.31.

• *SOUTHERN CALIFORNIA*: The speaker at the March meeting was S. K. Johnson, partner of Daniel, Mann, Johnson, and Mendenhall, architects and engineers, Los Angeles, Calif. Mr. Johnson spoke on *Architectural and Engineering Operations Around the World Today*. He specifically covered operations in Germany, England, France, Japan and India, giving the advantages and disadvantages of working in those areas.

Pres. L. B. Davenport called the meeting to order and then reported on the work of the codes and standards committee. Attendance 75.

• *SOUTHERN PIEDMONT*: The feature of the March meeting was an inspection tour through the new Celanese Corp. office building recently completed on the outskirts of Charlotte. The building is a modern office-plant, and members inspected the air conditioning systems installed for year 'round comfort.

Pres. R. S. Fullerton presided, and the minutes of the previous meeting were approved with a slight correction. C. M. Setzer, Jr., treasurer, presented the financial report, pointing out that dues were payable in April. Attendance 33. Attendance ratio 0.29.

• *VIRGINIA*: The feature of the March meeting was a talk by Lee Thompson, field engineer of Minneapolis-Honeywell Regulator Co., who spoke on *Electronic Combustion Control*.

Pres. H. E. Marquart called the meeting to order and the minutes of the previous meeting were read and approved. D. C. Delinger gave a report on the Chapters Conference Committee meeting held at the Annual Meeting in Houston. Attendance 23. Attendance ratio 0.31.

• *WASHINGTON, D. C.*: At the annual meeting in April, election results were announced as follows: *President*— G. C. F. Asker; *Vice President*—W. C. Reamy, Jr.; *Treasurer*— J. D. Crabtree; *Secretary*— C. P. Humke; *Board of Governors*: J. G. Muirheid, L. T. Davis, and E. F. O'Connell.

Pres. J. G. Muirheid presented a verbal annual report, telling of the growth of the Society, and the increase in importance of the Chapters Conference Committee. Treasurer J. W. Alexander presented his report, and S. R. Allen discussed the proposed new by-laws, which were accepted by the Chapter.

Past President G. R. Walz identified a number of members of long standing who were present and complimented them on their continued interest.

Mr. Walz introduced A. B. Newton, vice president, The Coleman Co., Inc., Wichita, Kans., who spoke on *Making Residential Air Conditioning Economical*. He stressed the importance of the production of versatile equipment, noted that increased air conditioning loads create problems for other phases of industry, and discussed the temperature at which people feel comfortable. Attendance 61. Attendance ratio 0.35.

• *WASHINGTON, D. C.*: L. G. Humphrey, chairman of the meetings committee, introduced the speaker, Albert Siepert, executive officer, *National Institutes of Health*. Mr. Siepert traced the development of the *NIH*, and stated that the Clinical Center is made up of seven sections — cancer, biochemistry, dental, arthritic and metabolic diseases, heart, neurology and blindness, and mental health. He explained that each section is allotted 500 beds for afflicted persons who are carefully selected for the particular work in which they are to participate. He stated that the study of large numbers of actual cases and experiments results in development of new methods of treatment and discovering of curatives.

Mr. Siepert's talk was followed by a very interesting tour of the Clinical Center and its new boiler plant.

During the March business meeting, presided over by Pres. J. G. Muirheid, the nominating committee presented its slate of nominees for 1954-55. Attendance 57. Attendance ratio 0.34.

• *WEST TEXAS*: O. P. Harlan, Jr., introduced the speaker at the March meeting, Cooley Richardson, refrigeration service manager for Nunn Electric Co., Lubbock, Tex. Mr. Richardson gave an interesting talk on the desirability of balancing the various components of a refrigeration system.

The meeting was held in the Caprock Hotel, and the minutes of the February meeting were read and approved. R. A. Mixon, member of the Chapters Conference Committee, gave a report on the 60th Annual Meeting in Houston. He also announced that during the meeting the representatives of each of the Texas Chapters got together and voted Reg. F. Taylor, Society past president, a Life Member of the Texas Chapters. Attendance 25. Attendance ratio 0.42.

• *WESTERN MICHIGAN*: The meeting was presided over by Pres. J. T. Anderson. The minutes of the previous meeting and the treasurer's monthly report were approved as read. A nominating committee was elected as follows: S. H. Downs, J. L. Alexander, and Frank Harbin; and the committee was requested to submit its slate of nominees at the April meeting.

F. W. Brundage introduced the speaker at the March meeting, Society First Vice Pres. J. E. Haines, Minneapolis, Minn., who gave an illustrated talk on *The Next Ten Years.* In his talk Mr. Haines predicted what the future would hold for the ASHVE and the heating, ventilating and air conditioning industry in general. Attendance 50. Attendance ratio 0.22.

• *WESTERN NEW YORK*: Chapter members were the guests of Westinghouse Electric Company for the March meeting. Dinner was served in the plant dining room.

An interesting sound film was shown presenting the many diversified uses of power and electricity. This was followed by a talk on the recent improvements in motor design. Attendance 35. Attendance ratio 0.33.

• *WISCONSIN*: H. K. Forfar, secretary, read a resolution of respect which had been forwarded to Mrs. J. R. Vernon.

H. F. Brinen reported on his trip to Houston as chapter delegate, and discussed the manual of chapter operations.

Appointments to the nominating committee were announced by Pres. N. E. Hill as follows: H. W. Schreiber, chairman; A. S. Krenz, and E. W. Gifford.

James Burke of the Milwaukee School of Engineering, representative of the Delta Alpha Upsilon Fraternity, presented an honorary membership and fraternity pin to Chapter member K. O. Werwath, speaker for the evening.

Introduced by L. C. Plaehn, Mr. Werwath talked on *New Trends in Engineering Education* at the chapter's March meeting. Mr. Werwath emphasized that engineering education, now in a period of transition, is of importance to everyone. He pointed out the need for higher quality standards for our engineering schools, and a greater turnout of engineering technicians, the newest development in the field. Attendance 44. Attendance ratio 0.18.

STUDENT BRANCH

• *PURDUE UNIVERSITY*: The Student Branch held a joint meeting with the Indiana Chapter of ASHVE for its March meeting. The speaker of the evening was F. C. Barton, partner, Barton Refrigeration Co., Indianapolis, Ind. Mr. Barton discussed the design and performance of the heat pump installed in the new Empire Life Insurance Building in Indianapolis. Following the talk, the group was taken on a tour of the building. Attendance 16. Attendance ratio 0.69.

I. W. COTTON ANNOUNCES CHANGE

I. W. Cotton, Indianapolis, Ind., member of the Council and the ASHVE Committee on Research, has announced the sale of The I. W. Cotton Co., Inc., to Chester C. Schuetz of Indianapolis.

Mr. Cotton is now operating the building at 1035 N. Pennsylvania St. and other interests as proprietor of the I. W. Cotton Building and Investment Co.

An active member of the Indiana Chapter of the Society, Mr. Cotton is also active in the Indianapolis Chamber of Commerce, a member of the Marion County Council, and other civic and fraternal organizations.

NEW *ARI* BOOK OF STANDARDS

The *Air-Conditioning and Refrigeration Institute*, 1346 Connecticut Ave., N. W., Washington, D. C., announces publication of the first set of *ARI Standards.* The edition includes 31 individual standards covering a wide range of air conditioning and refrigeration products. One chapter, of general interest, *Application Engineering Standard for Year-Round Residential Air Conditioning*, includes the Institute's recommendations for calculating cooling loads. Although this publication is the first to bear the *ARI* name, it is a revision of Standards published by *ARI's* predecessors, *ACRMA* and *REMA*.

NEW ANTHRACITE BOOKLET

A new booklet, *Automatic Anthracite Equipment for the Home*, may be obtained from the Anthracite Information Bureau, 380 Madison Ave., New York 17, N. Y. Designed for the guidance of engineers, architects, heating contractors, builders, and homeowners, the 40-page booklet describes new automatic vacuum ash removal systems, the application of year-round conditioning systems with automatic hard coal units, and all types of modern automatic anthracite warm-air and radiator heating systems for the home.

Candidates for Membership

The Society's By-Laws require that all applications for membership or advancement are to be sent to the Executive Secretary and the names of applicants and their references shall be printed in the next issue of the Journal of the Society, or mailed to all members. When the replies are received from references the Candidate's application shall be submitted to and acted upon by the Admission and Advancement Committee as soon as possible.

When the Admission and Advancement Committee has acted favorably upon a Candidate's application and assigned his grade, the Council shall confirm the election of the proposed Candidate for membership. During the past month there have been 142 applications for membership, including 27 students, 7 reinstatements; in addition 18 advancements have been received. The names of these men and their sponsors are published in the following list.

Members are requested to scrutinize the list with care. The Admission and Advancement Committee, and in turn, the Council, urge members to assume their share of responsibility of receiving these candidates into membership by advising the Executive Secretary promptly of any whose eligibility for membership is in any way questioned.

All correspondence in regard to such matters is strictly confidential, and is solely for the good of the Society, which it is the duty of every member to promote.

Unless objection is made by some member by June 30, 1954, these candidates will be voted upon by the Council. Those elected to membership will be notified by the Executive Secretary immediately after election.

Note: †Reinstatement. *Non-member. △Advancement.

Arizona

Near, J. W., Repr., Frank Hockett Co., Mesa. References: H. C. Caveness, P. L. Guest, Jr., A. J. Nelesen, Jr., H. D. Smith.

Pemberton, G. L., Jr. Engr., Frank Harmonson Co., Phoenix. References: A. C. Baechlin, Jr., R. A. Boehme, J. B. Hoaglund, W. L. Whitaker.

Taylor, J. L., Sales Engr., Climate Control Co., Phoenix. References: W. A. Biddle, V. J. Carns, Benjamin McLain, P. M. Tidmarsh.

California

Knezevich, Pete, Mgr., Htg. & Air Cond. Dept., Tay Holbrook Inc., Stockton. References: D. A. Delaney, J. E. Hedquist, D. B. Rodkin, R. A. Sarro.

Rifkin, David, Repr., Forman Supply Co., Oakland. References: G. N. Aranovsky, K. F. Baldwin, J. C. Beck, Donald McLeod.

Smith, C. V., Asst. Mgr., Utility Fan Corp., Los Angeles. References: E. C. Evans, M. C. Greiner, A. J. Hess, Leo Hungerford.

△Thomas, R. W., Engr., English and Lauer, Inc., Los Angeles. References: L. B. Davenport, A. J. Hess, J. L. McCullough, C. D. Walz.

Connecticut

Dyson, H. A., Project Engr., Tuttle & Bailey, Inc., New Britain. References: W. L. Batchelor, W. G. Kleinhomer, W. L. Lipski, R. D. Tutt.

Lawrence, R. W., Br. Mgr., Minneapolis-Honeywell Regulator Co., Hartford. References: J. E. Haines, R. T. Kern, W. H. Shipp, G. B. Torrens.

Stocks, E. G., Jr., Project Engr., Tuttle & Bailey, Inc., New Britain. References: W. L. Batchelor, W. G. Kleinhomer, W. L. Lipski, R. D. Tutt.

District of Columbia

†Corywell, G. L., Engrg. Consultant, National Coal Assoc., Washington. References: E. K. Campbell, A. R. Curtis, W. M. Davis, H. A. Thornburg.

Florida

Elbrecht, R. L., Technician, Johnson Service Co., Jacksonville. References: E. A. Smith, J. R. Spence, W. P. West, K. A. Wright.

Illinois

Bellis, S. B., Estimator, F. S. Bellis, Berwyn. References: R. D. Berry*, R. G. Graeser*, J. S. Kearney, R. E. Murphy*.

Colantonio, A. M., Chief Mech. Engr., Shaw, Metz and Dolio, Chicago. References: John Dolio*, R. E. Gilmore*, H. G. Gragg, Herman Koplin.

Gustafson, G. F., Mech. Engr., The Austin Co., Chicago. References: R. W. Brandon, L. A. Erickson, A. N. Nelson, G. V. Zintel.

Healy, G. R., Mech. Designer, Chicago Park District, Chicago. References: H. J. Couch, G. G. Freyder, H. G. Gragg, G. V. Zintel.

Johnson, G. H., Jr., Engr., Buffalo Forge Co., Chicago. References: C. C. Cheyney, J. E. Gill, W. R. Heath, E. P. Heckel, Jr.

Pierson, C. M., Chief Engr., Eureka Williams Co., Bloomington. References: H. E. Earl*, L. N. Hunter, O. E. Nesmith, M. W. McRae.

Salvesen, R. A., Vice Pres. Engrg., Bond Ventilating Inc., Chicago. References: J. K. Fairbairn*, Daniel Schiedecker*, H. C. Stevens, Norman Weinstein.

Smoot, R. L., Research Assist., University of Illinois, Urbana. References: H. D. Bareither, J. R. Carroll, Jr., J. R. Fellows, L. M. Zubko*.

Van Luvender, M. A., Designer, Berwyn Western Plumbing & Heating Co., Berwyn. References: A. R. Brueggeman*, E. L. Dailey*, N. J. MacIntyre*, H. F. Russell*.

Iowa

△Kelley, L. L., Designer, Campbell Heating Co., Des Moines. References: E. M. Arendts, C. H. McGuiness, W. E. Nanes, C. P. North.

Sieverding, W. F., Project Engr., Lennox Furnace Co., Marshalltown. References: W. E. Nanes, J. F. Sandfort, R. S. Stover, D. E. Wells.

Welch, J. R., Owner, James R. Welch Co., Des Moines. References: T. R. Johnson, G. J. Kraai, J. F. Sandfort, F. E. Triggs.

Kansas

Last, R. E., Repr., American Radiator & Standard Sanitary Co., Wichita. References: O. P. Bullock, E. E. Hysom, R. L. Pennington, H. M. Skalla.

△Robb, W. E., Chief Engr., Sonner Burner Co., Winfield. References: H. J. Leverance, E. J. McEahern, W. F. Ryan, S. J. Toth.

Louisiana

Casiraghi, R. J., Owner, Crown Sheet Metal Works, New Orleans. References: J. S. Adair, W. J. Johnson, Albert Lausch*, John Valencia*.

Lewis, R. D., Designer, Cary B. Gamble, New Orleans. References: Ralph Elizardi, C. B. Gamble, L. A. Lindberg, W. B. Martin, Jr.

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Von Woglom, W. W., Sales Mgr., Toole & Cunningham, New Orleans. References: O. F. Schully, T. A. Stokes, R. F. Taylor, J. D. Toole.

Maryland

Bennett, F. W., Charge of A. C. Installation, Air Duct Contractors, Baltimore. References: R. E. Dressell, George Kline*, H. G. Krayenhof*, R. J. Thompson.

Massachusetts

Anderson, A. H., Repr., Modine Mfg. Co., Boston. References: John Bonner, O. E. Desmond, A. G. Dixon, Benjamin Spieth.

Burbo, L. H., Field Engr., Weil-McLain Co., Boston. References: D. W. Blair, John Bonner, W. G. Burbo, A. L. Hare.

Michigan

Rynbrand, G. W., Owner, Glen W. Rynbrand Co., Kalamazoo. References: F. W. Brundage, R. S. Canning, R. W. Wilson, H. W. Wolters.

Minnesota

Ammerman, E. A., Mgr., C. L. Ammerman Co., Minneapolis, Minn. References: L. C. Gross, L. D. Freeland, C. E. Gausman, B. J. Mulcahy.

Cherne, L. G., Owner, Cherne Agency, Minneapolis. References: Robert Fridley*, Thor Holter*, H. K. Johnson, John Mikesh*.

Etnier, R. J., Repr., Minneapolis Gas Co., Wayzata. References: J. V. Borry, R. T. Haley, S. E. Johanson, V. E. Pearson.

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△Pfost, J. F., Partner, Ericksen and Pfost, Cons. Engrs., St. Paul. References: J. A. Craig, G. M. Kendrick, E. F. Lange, William Sturm.

△Schneeberg, F. H., Air Cond. & Sheet Metal Dept. Head, Wm. Hood Dunwoody Institute, Minneapolis. References: J. A. Craig, K. A. Cronstrom, E. J. Johnson, J. R. Younger.

Missouri

△Gross, Lester, Chief Engr., General Installation Co., University City. References: E. T. Clucas, G. W. F. Myers, G. B. Pattiz, H. C. Sharp.

Holtgrewe, R. H., Br. Mgr., Ilg Electric Ventilating Co., St. Louis. References: J. H. Maloney, N. R. Maloney, G. B. Pattiz, W. A. Russell.

Johnson, K. E., Gen. Mgr., J. F. Pritchard & Co., Kansas City. References: H. E. Gould, P. C. Leffel, L. T. Mart, Henry Nottberg, Jr.

△Keller, E. S., Vice Pres., Temperature Engineering Corp., Kansas City. References: R. S. Beachy, Jr.*, F. J. Dean, Jr., C. E. Kemper*, G. H. Stoffer.

△McCann, S. C., Owner, S. C. McCann Co., Kansas City. References: H. A. Atwater, W. E. Howarth, L. N. Hunter, W. A. Reichow.

△Pattiz, G. B., Engr., General Installation Co., St. Louis. References: C. H. Burnap, E. W. Clucas, B. L. Evans, H. C. Sharp.

New Jersey

Anderson, R. D., Vice Pres., General Register Corp., Cedar Grove. References: E. J. Busch, John Scanlon*, H. C. Sharp, G. J. Sweeney.

Green, W. P., Chief Engr., Engineers Co., Inc., Newark. References: H. A. Brangs, H. S. Dick, I. B. Miller, C. A. Perelli.

Horn, Walter, Research Engr., L. J. Wing Mfg. Co., Linden. References: Adam Currie, T. R. Peyrek, C. H. Smith, H. S. Wheller.

Sharpe, I. P., Mgr. Product Planning, General Electric Co., Bloomfield. References: F. H. Faust, S. J. Levine, C. M. toeLaer, T. N. Willcox.

New Mexico

Adair, R. D., Jr., Mech. Engr., United States Air Force, Albuquerque. References: F. H. Bridgers, J. K. James, Hugh Munn, J. H. Van Alsburg.

Blair, B. R., Draftsman, Mech. Design Section, University of California, Los Alamos. References: J. K. James, H. F. Munn, H. K. Pride, C. R. Wherritt.

Dion, J. R., Field Maintenance Engr., Los Alamos Scientific Lab., University of California, Los Alamos. References: Earl Craven*, Paul Hegler*, G. A. Profita*, C. R. Wherritt.

Gunter, N. P., Operations Mgr., Technical Service Co., Albuquerque. References: J. K. James, H. F. Munn, H. K. Pride, J. H. Van Alsburg.

Hall, R. A., Distr. Mgr., Reznor Manufacturing Co., Albuquerque. References: Elmo Hall, J. K. James, H. F. Munn, J. H. Van Alsburg.

Hargenrater, T. V., Field Engr., Los Alamos Field Office, University of California. References: J. K. James, H. F. Munn, J. H. Van Alsburg, C. R. Wherritt.

Lee, R. P., Br. Mgr., Johnson Service Co., Albuquerque. References: A. W. Cooper, J. K. James, H. K. Pride, E. F. Ross.

McCall, W. M., Section Leader, University of California, Los Alamos. References: F. H. Bridgers, J. B. Graham, D. D. Paxton*, R. J. Walker.

McDonald, R. N., Staff Member, Scientific Laboratory, University of California, Los Alamos. References: J. K. James, H. F. Munn, H. K. Pride, C. R. Wherritt.

Merryman, R. G., Mech. Engr., Scientific Laboratory, University of California. References: F. H. Bridgers, J. K. James, H. F. Munn, C. R. Wherritt.

Sweikhardt, K. W., Owner, Air Equipment Co., Albuquerque. References: F. H. Bridgers, Howard Cliffords*, H. V. Frankenfeld, L. J. Mahoney*.

Van Woerkom, P. A., Vice Pres., F. B. Gardner Co., Inc., Albuquerque. References: F. B. Gardner, A. J. Hess, J. K. James, C. R. Wherritt.

Varley, H. H., Estimator, F. B. Gardner Co., Inc., Albuquerque. References: F. B. Gardner, J. K. James, E. F. Ross, C. R. Wherritt.

Wahlen, J. P., Mech. Engr., Scientific Laboratory, University of California, Los Alamos. References: M. H. Canham, J. B. Graham, R. J. Walker, Ernst Wetzel*.

Whitnell, N. H., Distributor, York Corp., Albuquerque. References: F. H. Bridgers, E. A. Froese, H. E. Gould, G. M. Sebree.

New York

△Arteca, Nicholas, Designer, Guy B. Panero, New York. References: H. E. Boss, H. G. Junger, W. T. Kane, M. Stubb*.

△Aksman, Lester, Owner, Kool-Flow Co., New York. References: Herbert Hecht, H. P. Lewis, George Moncher*, A. A. Sylvane.

Barnhart, J. M., Exec. Director, Industrial Mineral Fiber Institute, Inc., New York. References: P. C. Hutchins, H. E. Lewis, H. J. Ryan, H. W. Walsh*.

Brieger, Fred, Sr. Mech. Designer, H. K. Ferguson Co., New York. References: Selwyn Bloome*, C. H. B. Hotchkiss, H. H. Levee*, Benjamin Spivack*.

†Bynum, William, Exec. Vice Pres., Carrier Corp., Syracuse. References: W. A. Grant, L. L. Lewis, A. E. Stacey, Jr., R. F. Taylor.

†Dennis, C. K., Mfrs. Agent, Avco Mfg. Corp., Binghamton. References: H. K. Ormsby, Jr., P. D. Robson, L. E. St. John, Merle Weninger.

Hilton, Lee, Designer, Foster & Cafarelli, New York. References: C. J. Foster*, W. L. Gabbert, T. M. Reed, Jr., J. R. Smith*.

McNally, E. J., Engr., Johnson Service Co., Syracuse. References: C. R. Acheson, F. W. Chadwick, R. V. Griffith, C. F. Woese.

Noffey, J. T., Repr., Inland Supply Inc., Syracuse. References: F. E. Bean, H. J. Morton, H. K. Ormsby, Jr., J. W. Stevens.

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Sarney, Simon, Naval Architect, U.S. Navy, New York. References: John Bulyk, Nathan Friedland, Mandell Rosenblatt*, William Young*.

Sliney, C. M., Asst. Sales Mgr., Taco Heater, Inc., New York. References: S. G. Haynes, E. T. Houlihan, J. R. Murphy, W. J. Sliney.

Wurmfeld, C. J., Consulting Engr., New York. References: Samuel Carr*, Leon Grad*, Homer Hosking*, G. E. Olsen.

North Carolina

△Karnes, T. C., Engr., The Bahnson Co., Winston-Salem. References: L. H.

Allcorn, Jr., W. H. Cooper, C. C. Cornwall, Arvin Page.

Ohio

△Brehm, L. P., Jr., Engr., Minneapolis-Honeywell Regulator Co., Dayton. References: C. T. Doudican, J. B. Rishel, J. M. Schweiger, C. D. Weaver, Jr.

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Briley, H. D., Chief Engr., Deering Air Conditioning Co., Cincinnati. References: T. J. Deering*, R. F. McAndrews, R. T. Smith*, H. E. Sproull.

Calahan, W. H., Vice Pres., The Williamson Heater Co., Cincinnati. References: S. C. Baer*, Harold Kahle, M. Smith*, J. Von Meyer*.

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Fruth, R. I., Pres., The Robert I. Fruth Co. Inc., Toledo. References: I. W. Cotton, F. A. Edgington, J. F. Guest, C. F. Hoffman.

Gettings, P. W., Mgr., Toledo Central Supply Co., Toledo. References: A. K. Anderson*, C. A. Hider*, Donald Scholz*, Robert Thyer*.

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Heilman, J. J., Owner, Mason Equipment Co., Toledo. References: F. A. Edgington, J. F. Guest, C. F. Hoffman, F. C. Richardson, Jr.

Katafiasz, E. J., Estimating Engr., Dunbar Drilling & Supply Co., Delta. References: F. A. Edgington, J. F. Guest, C. F. Hoffman, F. C. Richardson, Jr.

Meyer, J. S., Engr., Minneapolis-Honeywell Regulator Co., Toledo. References: H. R. Canoyer, F. A. Edgington, C. F. Hoffman, C. H. Starkey.

Moorhead, R. C., Mech. Engr., Bellman, Gillett & Richards, Toledo. References: J. F. Guest, C. F. Hoffman, A. H. Lumm, Jr., F. C. Richardson, Jr.

Roper, E. H., Chief Mech. Engr., The A. Bentley & Sons Co., Toledo. References: Carl Eyester*, John Gillett*, F. L. Lauer*, F. C. Richardson, Jr.

Schaeffer, Fred, Chief of Maintenance, Rike Kumler Co., Dayton. References: J. T. Coughlin, F. H. Doench, Jr., M. O. Heapy, J. M. Schweiger.

Thom, J. C., Supvsr., John Thom Plbg. & Htg. Co., Toledo. References: H. W. Dirks, F. E. Poseler*, C. J. Shine*, I. E. Snyder*.

Turner, B. F., Engr., Crawford Power Equipment Co., Cincinnati. References: R. B. Barbara, R. C. Beineke, W. A. Fennell, K. M. Reik.

Oklahoma

+Krueger, H. R., Engr., Governair Corp., Oklahoma City. References: Harold Feldstein, F. X. Loeffler, W. H. Moler, K. L. Sain.

Leftwich, W. V., Owner, Midwest Insulation & Material Co., Oklahoma City. References: J. H. Carnahan, G. E. Ervin, A. C. Shelley, R. E. Swan.

△Shelley, A. C., Engr., The Gordon E. Ervin Co., Oklahoma City. References: W. J. Collins, Jr., G. E. Ervin, K. L. Sain, R. E. Thomasson.

Pennsylvania

Ade, J. T., Designer, Blankin Equipment Corp., Philadelphia. References: M. F. Blankin, C. F. Dietz, H. H. Erickson, A. E. Kriebel.

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Hubbell, D. S., Sr. Fellow, Mellon Institute of Industrial Research, Pittsburgh. References: R. H. Heilman, W. C. L. Hemeon, F. A. Joy, L. S. Maehling.

Metzger, H. G., Jr., Mech. Engr., Bristol Engineering Corp., Bristol. References: R. C. Burton*, A. C. Caldwell, C. T. Dingleman*, R. R. Wiese*.

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South Carolina

Leland, W. B., Cons. Engr., Charleston. References: C. Z. Adams, W. E. Crews*, P. L. Guest, Jr., G. B. Rottman.

Wood, W. A., Promoter Heating Sales, Crane Co., Greenville. References: Gray McCalley, R. K. Rouse, C. D. Tucker, J. E. Waldrep.

Texas

Biggi, F. J., Owner, B-G Engineering Co., Houston. References: D. S. Cooper, E. G. Floeter, Jr., O. G. Rivoire, Norman Way.

Davis, A. B., Engr., Sturtevant Div., Westinghouse Electric Corp., Dallas. References: P. G. Bentley*, H. G. Gregerson, G. H. Meffert, S. I. Sirmen.

Eubank, T. E., Engr., J. R. Dowdell & Co., Lubbock. References: N. R, Collins, Jr., J. R. Dowdell, D. G. Halley, R. C. Wallis, Jr.

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McLanson, B. C., Draftsman, Lafayette McKay, Cons. Engr., Lubbock. References: R. B. Carow, F. L. Gray, R. A. Mixon, T. F. Sartor.

Saustad, C. O., Jr., Design Engr., Almar-York Co., Inc., Fort Worth. References: W. R. Barbeck, M. L. Brown, A. W. Stubbeman, J. L. Tye.

Virginia

Gustin, J. A., Mgr., Coleman Supply Co., Martinsville. References: F. T. Adams*, Arthur Bond*, R. S. McClellen*, H. L. Sizer*.

Washington

Brand, W. T., Office Mgr., Merrill N. Musgrave & Co., Spokane. References: E. W. Bunnell, J. A. Doyle, F. W. Jenkinson, K. M. Wood.

Cheek, D. J., Repr., Crane Co., Spokane. References: E. W. Bunnell, W. A. Crowder, J. L. Harvey, G. C. Murray.

Macielag, Frank, Factory Repr., American Radiator & Standard Sanitary Corp., Spokane. References: W. H. Ashley, Jr., L. E. Marque, Earl Miller, K. M. Wood.

Pearson, Jack, Mgr., Northwest States Supply Co., Spokane. References: W. A. Crowder, J. A. Doyle, J. L. Harvey, L. E. Marque.

Weidner, D. E., Mfrs. Repr., National Radiator Co., Spokane. References: M. A. Clerc, G. M. Dieter, L. E. Marque, Max Tonn.

Wisconsin

Guthrie, R. M., Engr., Barber-Colman Co., Milwaukee. References: E. L. Aken, M. J. Bamond, V. P. Hansen, L. C. Plaehn.

Price, H. W., Repr., Trane Co., Milwaukee. References: Bert Fredericksen, L. W. Hessler, J. A. Lofte, S. C. Swisher, Jr.

Canada

△Baldwin, W. G., Field Engr., Canadian Sirocco Co., Ltd., Toronto. References: F. G. Ewens, W. J. McLean, H. R. Roth, G. E. Smith.

Goodkey, G. W., Engr., C. A. Dunham Co., Ltd., Ottawa. References: M. C. Bailey, W. A. E. Frost, G. A. Gray, M. W. Shears.

Greening, R. E., Equipment Tester, Warden King Co., Ltd., Montreal. References: F. L. Armitage, H. G. Gittleson, G. K. Lynes, J. A. Sullivan.

△Kerr, C. G., Pres., Kent Engineering Co., Montreal. References: Robert Clapperton, Arthur DeBryne, Ralph Grossman, E. W. Twizell.

Lefebvre, E. S. J., Heating Mgr., La Riviere Inc., Mount Royal. References: F. L. Armitage, H. G. Gittleson, G. K. Lynes, J. A. Sullivan.

†Miles, H. W., Charge of Mech. Services, The Foundation of Canadian Engineering Corp., Ltd., Toronto. References: W. R. Blackhall, T. C. Clapperton, S. M. Peterkin, H. R. Roth.

Nordstrom, A. N., Contract Mgr., H. Kelly & Company Ltd., Edmonton. References: P. M. Butler, Keith Cummings*, Hugh Kelly, Dave Panar.

Stephen, R. G., Repr., Taylor-Forbes, Ltd., Montreal. References: Robert Clapperton, D. L. Lindsay, W. W. Robinson, Paul Thibault.

France

deRoussan, Roger, Head of Technical Commercial Dept., Ste Ventec, Paris.

JOURNAL SECTION

ASHVE RESEARCH LABORATORY HAS SOUTH AFRICAN VISITOR

Housing design and building construction problems in South Africa are strikingly similar to those encountered in the United States, according to Chairman R. S. Dill, of the Society's Committee on Research, at the conclusion of a visit by S. J. P. Joubert, staff engineer of the *National Building Research Institute* of the South African Council for Scientific and Industrial Research.

Mr. Joubert spent several months in the United States for a study of American techniques and instrumentation in order to compile accurate and complete data on heat transfer studies of construction that will provide comfort in unconditioned houses.

He wanted to become familiar with techniques and instrumentation methods of other countries and had been a guest of the Building Research Station in England. When he arrived in this country he came to the ASHVE Research Laboratory in Cleveland, where the results of solar radiation studies of 25 years, published in the Society's TRANSACTIONS, were made available to him.

For approximately two months, Mr. Joubert worked with the Laboratory Staff, particularly on heat transfer and thermal circuit techniques. The Committee on Research and the Laboratory Staff appreciated his interest and able assistance.

S. J. P. Joubert

ENGINEERING INSTITUTE OF CANADA HAS NEW PRESIDENT

Following a recent meeting of the Council of *The Engineering Institute of Canada*, held May 12-14, it was announced that D. McG. Stephens, Winnipeg, Manitoba, Canada, was elected president of the Institute. This professional organization has 47 branches and 16,000 members.

The new president is chairman and general manager of The Manitoba Hydro-Electric Board, and president and general manager of the Winnipeg Electric Co. From 1938 to 1951, he was Deputy Minister of the Manitoba Department of Mines and Natural Resources. He is a former chairman of the Winnipeg branch of the Institute and a former member of its Council.

ASHVE MEMBER SPEAKS AT FIRST AIR CONDITIONING, HEATING AND VENTILATING CONFERENCE

Air conditioning is striding forward with such vigor, and advancements in heating and ventilating equipment are being perfected so rapidly that dealers, contractors, and manufacturers have been hard put to keep abreast of latest developments and research data.

Recognizing the need for profession and industry to be brought up-to-date, the University of Utah, Mechanical Engineering Department, in cooperation with Utah Chapters of ASHVE and *ASME*, sponsored the first Annual Air Conditioning, Heating, and Ventilating Conference, April 29-30 at Salt Lake City, Utah.

The climax of the Conference, the banquet on Friday night, April 30, was highlighted by a speech by one of the country's outstanding engineers, A. J. Hess, president of Hess-Greiner and Polland, Los Angeles, Calif., who spoke on *New Horizons in Air Conditioning*. A member of the Council of ASHVE, he has served the Society in many technical capacities, and is chairman of the Society's Technical Advisory Committees on Evaporative Cooling and Plant and Animal Husbandry. He is also president of the *ASRE*.

Those attending the Conference heard talks on year-round air conditioning with package units, air conditioning and architecture, high velocity duct design, venting of gas equipment, comparison of design practices in heating and air conditioning, modern air cleaning, local winter air conditioning, the heat pump story, recent developments in air conditioning, history of heat, and automatic controls for heating and air conditioning.

REFERENCES: C. H. Cottignies, Andre Delalande, Henry Gregory, Rene Modiano.

Italy

Guarini, Mario, Gen. Mgr., Marelli Aerotecnica, Milan. REFERENCES: S. W. Brown, A. E. Rabe, J. M. Rachal*, Americo Silvera.

Southern Rhodesia

†Neuman, S. L., Mgr., Air Cond. & Refrig. Dept., Johnson & Fletcher Ltd., Salisbury. REFERENCES: W. J. Nelson*, L. W. Richards*, R. E. Thompson, Alexander Sibert.

Students

A. & M. COLLEGE OF TEXAS, College Station, Texas. CERTIFIED BY: L. S. O'Bannon.

Alvarado, R. J.
Cook, G. W., Jr.
Darville, R. W.
Shanklin, R. D.

OREGON STATE COLLEGE, Corvallis, Ore. CERTIFIED BY: G. E. Thornburgh.

Conway, N. G.
Harmala, H. W.

PURDUE UNIVERSITY, Lafayette, Ind. CERTIFIED BY: F. B. Morse.

Berger, W. E.

UNIVERSITY OF DETROIT, Detroit, Mich. CERTIFIED BY: J. E. Lay.

Byrne, R. A.
Cinat, L. J.
Conte, J. B.
Doherty, W. J.
Flynn, E. F., Jr.
Gates, L. L.
Harrison, M.
Hoffman, C. L.
Jesionowski, R.
Kearn, D. J.
Lostoski, E. A.
Meyers, R. G.
Rebstock, N. A.
Shea, J. F.
Sved, J. R.
Toth, R. B.
Trembler, E. J.
Watt, E. C.
Zadzilka, E. R.

UNIVERSITY OF KENTUCKY, Lexington, Ky. CERTIFIED BY: Merl Baker.

Crouch, W. G.

JOURNAL SECTION

OBITUARIES

GEORGE F. BALL
Des Moines, Ia.

The Society is sorry to announce the passing of its member, George F. Ball of Des Moines, Ia.

Mr. Ball was born on February 20, 1899 at Des Moines, and attended school there. In 1916 he joined the Globe Machinery and Supply Co., later becoming manager of the Plumbing and Heating Department. He remained with the firm until 1946 at which time he became a partner of the Central Plumbing and Heating Service of Des Moines. He acted as manager of the firm and served in this capacity until the time of his death.

WILLIAM E. BAXTER
Lachine, Que., Canada

From the Montreal Chapter, the Society regretfully learned of the death of William E. Baxter, on March 30, at the age of 71.

Mr. Baxter, a member of the Society since 1939, was born in London, January 19, 1883. He was educated at St. Mary's School, and the Borough Polytechnic in London. From 1897-1907, he worked in London as an apprentice and journeyman. After he came to Canada in 1907, he was foreman at the Canadian Blower and Forge Co. and then manager at McFarlane-Douglas, both of Montreal. In 1921, he went into business, Baxter and Webber, Ltd., and at the time of his death was president of the firm of W. E. Baxter, Ltd., Montreal. He was also a life governor of the Lachine General Hospital.

Some of the well-known buildings Mr. Baxter did work on included: McGill University, Windsor Station, and the Chateau Frontenac in Quebec.

ROBERT L. BRIDGMAN
Washington, D. C.

Robert L. Bridgman died on March 23, 1954, following many months of illness. Mr. Bridgman was a Society member since 1945.

Born on February 15, 1891 at Waupaca, Wis., he attended Beloit College, graduating in 1914 with a Bachelor of Science degree. He joined the American Radiator & Standard Sanitary Company in 1916 and remained with the firm until his death. At the time of his death he was government representative for the company.

Mr. Bridgman is survived by his wife, Elizabeth; two daughters, Mrs. J. D. Shields and Mrs. H. L. Hays, both of Columbus, Ohio, and two sisters and six grandchildren, to whom the Society offers its deepest sympathy.

ROBERT BRUEN
Lafayette, Calif.

It was with deep regret that the Society learned of the death of Robert Bruen, Lafayette, Calif., on April 3. Mr. Bruen, a heating contractor and partner of Robert Bruen and Son, Oakland, had been a member of the Society since 1945.

Born June 14, 1892 in Chicago, Mr. Bruen attended Hyde Park and Berkeley High Schools, graduating in 1910. He was employed in various capacities by the American Radiator Co., San Francisco. Since 1928, Mr. Bruen worked as a heating contractor, and did experimental work with radiant heating. He designed and installed radiant panel warming systems for numerous residential and industrial structures.

Mr. Bruen is survived by his wife, Mrs. Dorothy P. Bruen, to whom the Officers and Council extend their sincere sympathy.

JAY W. SNYDER
Detroit, Mich.

The Society was grieved by the news of the death of Jay Willard Snyder, 65, at his home in Detroit, Mich., on April 14. Mr. Snyder had been ill for some time, and just two days before his death had been presented in absentia with a Life Membership in the Society. His immediate family expressed their appreciation for this honor bestowed upon him.

Mr. Snyder was born in Battle Creek, January 16, 1889. He attended Battle Creek High School and received his B. M. E. from the University of Michigan in 1911. After four years of varied drafting experience, he joined the firm of Ammerman & McColl, Detroit, as supervising engineer. He later became a member of the firm, now known as Snyder & McLean, and acquired a wide reputation as a consulting mechanical engineer.

Plans and engineering specifications for buildings at Michigan State College and the University of Michigan were prepared by Mr. Snyder.

He was a member of the Society for 37 years. The Officers and Council of the Society extend their deepest sympathy to his widow, Mrs. Marie Snyder; his son, Willard; his daughter, Mrs. Margaret E. Diskin; and his mother, Mrs. Beulah Snyder.

THOMAS N. THOMSON
Huntington, L. I.

The Society announces with deep regret the passing of one of its Life Members, Thomas N. Thomson, retired metal trade publication executive, editor, and sanitary engineering consultant.

He was born at East Wemyss, Fifeshire, Scotland, May 29, 1867, and was educated in the public schools of that community. He later attended Herriot-Watt College in Edinburgh, Scotland, and the Science and Art Department in London, England.

Between graduation from public schools and college entrance, he served from 1881 to 1884 as apprentice plumber and hot water fitter with his father in East Wemyss. For the next four years he was improver to a journeyman plumber and fitter in Edinburgh. He came to the United States in 1889, and worked as journeyman plumber and fitter, and contractor for six years.

Mr. Thomson founded the Schools of Sanitary Engineering and of Plumbing, Heating and Ventilating for International Correspondence Schools, Scranton, Pa., in 1895, and served as principal until 1916, when he set up offices as a consulting engineer, and accepted the associate editorship of the *Plumbers Trade Journal*, published in New York. He was the author of several text books for heating and ventilating courses in the I.C.S. While principal, he was responsible for the technical direction of more than 45,000 students through direct mail courses.

Mr. Thomson conducted several series of tests and research projects on the physical properties of wrought-iron and steel pipe. He was an authority on the history and development of copper as a metal, and on its use in straight pipe and coils for panel heating.

He was accepted as a member of ASHVE in 1899, shortly after arriving in this country. An active member, the author of several technical papers on pipes and piping systems, he was an early exponent of radiant heating, and prepared several books on piping for heating panel use. *The Copper and Brass Research Association*, about 1923, asked Mr. Thomson, as the outstanding man in the plumbing field, to write a handbook on installation of brass pipe for plumbing. Years later he authored a handbook, *Copper Tube*, for architects, engineers and contractors. He was chairman of the Society Committee on Pipe Corrosion in 1909. In 1937 he was elected to Life Membership in the Society.

He was a charter member of the Huntington Volunteer Fire Department, and a life member of Jeptha Lodge of Masons. He served as elder of the First Presbyterian Church of Huntington, and was a director of the *Huntington Federal Savings and Loan Association* for 30 years.

Mr. Thomson is survived by three sons, John B., Norman B., and Harold N. Thomson; two daughters, Mrs. Sidney Cramp and Mrs. George Riecke, and a brother, James B. F. Thomson, to whom the Officers and Council express their sincerest sympathy.

C. W. OBERT, FORMER ASHVE SECRETARY, DEAD

Society members will be sorrowed to learn of the passing, April 16, of one of the former officers, Casin Watson Obert. He died in Norwalk Hospital, Norwalk, Conn., after a short illness. Mr. Obert was born at Unadilla, Mich., on October 9, 1876, and gained his early mechanical experience as boiler tender in his father's mill.

He was graduated from Columbia University in 1902 with a degree in Mechanical Engineering. Following his graduation he served as associate editor of *Machinery*, *American Engineer* and *Railroad Journal*, and on *Engineering Record*, successively. On the latter publication he made a specialty of the heating and ventilating branch of engineering. He was president of the Atlantic Machine Co. of Brooklyn in 1909, and in addition to building up the business, he did considerable consulting work, such as, producer gas power efficiency tests, and improvement of power plant installations. He assisted in editing the Report of the Boiler Code Committee of the *American Society of Mechanical Engineers* and was later a member of the Committee.

In 1916, Mr. Obert became a member of ASHVE and a short time later assumed the duties of Secretary. Pressure to do consulting and research in welding prompted his resignation in May of 1923. His term as Secretary was marked by decided increase in ASHVE membership.

Mr. Obert's research in welding of boilers and other pressure tanks and vessels lead the *ASME* to approve his recommendations as a body of rules in the welding field.

He is survived by a daughter, Mrs. Marion O. Freeman, with whom he made his home at Westport, Conn.

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*Member of Committee on Research.

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(56 Chapters; 1 Special Branch; 8 Student Branches)

Date indicates year organized; an address and no city shown signifies same city as headquarters; numeral in parentheses indicates zone.

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- **ARKANSAS:** 1952. Hdqrs., Little Rock, Ark. Meets, Third Tuesday. PRESIDENT, R. E. Blaylock, 509 E. Markham St. SECRETARY, J. L. Brown, 212 Terminal Warehouse Bldg.
- **ATLANTA:** 1937. Hdqrs., Atlanta, Ga. Meets, Second Monday. PRESIDENT, J. G. Croley, 400 Batavia St., East Point, Ga. SECRETARY, T. A. Barrow, 157 Simpson St., N.W.
- **BALTIMORE:** 1949. Hdqrs., Baltimore, Md. Meets, Third Wednesday. PRESIDENT, H. D. Glaser, Federal Land Bank Bldg., 2315 St. Paul St. (18). SECRETARY, G. J. Senner, 6010 Edmondson Ave. (28).
- **BRITISH COLUMBIA:** 1952. Hdqrs., Vancouver, B.C., Canada. Meets, Second Wednesday. PRESIDENT, S. C. Gale, 1628 W. 4th Ave. SECRETARY, D. A. English, 1606 W. 1st Ave. (9).
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- **CENTRAL OHIO:** 1944. Hdqrs., Columbus, Ohio. Meets, Third Monday. PRESIDENT, N. T. Hess, 63 E. Goodale St. SECRETARY, R. A. Wilson, 20 S. Third St., (15).
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- **DELTA:** 1939. Hdqrs., New Orleans, La. Meets, Third Tuesday. PRESIDENT, H. L. Salaun, 317 Baronne St. SECRETARY, T. J. Jenny, 1000 S. Peters St., (9).
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- **INDIANA:** 1943. Hdqrs., Indianapolis, Ind. Meets, Fourth Tuesday. PRESIDENT, R. C. Blackman, 5505 N. Illinois St., (8). SECRETARY, J. W. Jackson, 3514 N. Drexel, (18).
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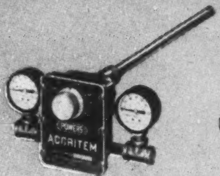
- **IOWA:** 1940. Hdqrs., Des Moines, Ia. Meets, Second Tuesday. PRESIDENT, W. E. Nanes, 220 Davidson Bldg. SECRETARY, D. E. Schroeder, 2717 Cambridge.
- **KANSAS:** 1951. Hdqrs., Wichita, Kan. Meets, Tuesday after First Monday. PRESIDENT, Charles Yoe, P.O. Box 2239. SECRETARY, T. L. Roberts, 2008 S. Parkwood Lane.
- **KANSAS CITY:** 1917. Hdqrs., Kansas City, Mo. Meets, First Monday. PRESIDENT, F. K. Ladewig, 3527 Broadway (11). SECRETARY, R. M. Spencer, 1510 Main St.
- **MANITOBA:** 1935. Hdqrs., Winnipeg, Man., Canada. Meets, Fourth Thursday. PRESIDENT, A. K. Piercy, 222 Osborne St. N. SECRETARY, D. B. Brace, 1550 Dublin Ave.
- **MASSACHUSETTS:** 1912. Hdqrs., Boston, Mass. Meets, Third Tuesday. PRESIDENT, A. L. Hare, 127 Federal St. (10). SECRETARY, W. G. Martin, Jr., 20 Winchester St. (16).
- **MEMPHIS:** 1944. Hdqrs., Memphis, Tenn. Meets, Third Monday. PRESIDENT, A. W. Shelby, 972 Union Ave. SECRETARY, A. T. Bevil, 1638 Union Ave. (4).
- **MIAMI VALLEY:** 1950. Hdqrs., Dayton, Ohio. Meets, First Wednesday. PRESIDENT, John Schweiger, 593 Acorn Drive, (9). SECRETARY, D. E. Tullis, 743 Kiser St. (4).
- **MICHIGAN:** 1916. Hdqrs., Detroit, Mich. Meets, First Monday after 10th of month. PRESIDENT, R. H. Oberschulte, 316 McKerchey Building, (1). SECRETARY, D. S. Falk, 4864 Woodward Ave. (1).
- **MINNESOTA:** 1918. Hdqrs., Minneapolis, Minn. Meets, First Monday. PRESIDENT, J. A. Craig, 814 South Ninth St. (4). SECRETARY, E. T. Erickson, 500 Baker Arcade (2).
- **MISSISSIPPI:** 1953. Hdqrs., Jackson, Miss. PRESIDENT, I. E. Rowe, 120 Georgia St. SECRETARY, M. E. Price, 205 Arbor Hill Dr.
- **MONTREAL:** 1936. Hdqrs., Montreal, Que., Canada. Meets, Third Monday. PRESIDENT, D. L. Lindsay, 4350 Sherbrooke St. (6). SECRETARY, S. R. Plamondon, 1570 St. Hubert St. (14).
- **NEBRASKA:** 1940. Hdqrs., Omaha, Neb. Meets, Second Tuesday. PRESIDENT, O. J. Smith, 233 Grain Exchange Bldg., (2). SECRETARY, S. W. Black, 18th & Harney Sts.
- **NEW YORK:** 1911. Hdqrs., New York, N. Y. Meets, Third Monday. PRESIDENT, R. L. Stinard, 51 E. 42nd St. (17). SECRETARY, Carl H. Flink, 62 Worth St. (13).
- **NORTH JERSEY:** 1952. Hdqrs., Newark, N. J. Meets, Second Tuesday. PRESIDENT, H. M. Patrick, 20 Olcott Ave., Bernardsville. SECRETARY, W. C. Kruse, Jr., 40 E. Park St. (2).
- **NORTH TEXAS:** 1938. Hdqrs., Dallas, Tex. Meets, Third Monday. PRESIDENT, M. W. Brown, 1213 Texas Bank Bldg. SECRETARY, H. G. Gregerson, 2921 Fairmount.
- **NORTHEASTERN OKLAHOMA:** 1948. Hdqrs., Tulsa, Okla. Meets, Second Tuesday. PRESIDENT, R. W. Winget, 2428 E. 11th St., Box 100. SECRETARY, J. T. McKinney, 1341 So. Boston.
- **NORTHERN OHIO:** 1916. Hdqrs. Cleveland, Ohio. Meets, Second Monday. PRESIDENT, J. M. Black, 1296 Gordon Rd., Lyndhurst. SECRETARY, Sherwood Nassau, 6014 Euclid Ave.
- **NORTHERN PIEDMONT:** 1952. Hdqrs., Greensboro, N.C. Meets, Second or Third Friday. PRESIDENT, R. B. Crosland, Jr., 1001 S. Marshall St., Winston-Salem. SECRETARY, W. H. Cooper, 1001 S. Marshall St., Winston-Salem.
- **OKLAHOMA:** 1935. Hdqrs., Oklahoma City, Okla. Meets, Second Monday. PRESIDENT, F. X. Loeffler, Jr., Box 529. SECRETARY, G. E. Ervin, 2800 N. Oklahoma St. (5).
- **ONTARIO:** 1922. Hdqrs., Toronto, Ont., Canada. Meets, First Monday. PRESIDENT, N. W. Kingsland, 31 Willcocks St. SECRETARY, H. R. Roth, 57 Bloor St., W.
- **OREGON:** 1939. Hdqrs., Portland, Ore. Meets, Thursday after First Tuesday. PRESIDENT, E. E. Kelly, 4504 S.W. Corbett Ave. (1). SECRETARY, K. N. Flocke, 3027 N.E. 31st Ave. (12).
- **OTTAWA VALLEY:** 1952. Hdqrs., Ottawa, Ont., Canada. Meets, Third Tuesday. PRESIDENT, G. L. Ostiguy, 282 Westhill Ave. (3). SECRETARY, N. J. Howes, Box 264, R. R. 1.
- **PACIFIC NORTHWEST:** 1928. Hdqrs., Seattle, Wash. Meets, Second Tuesday. PRESIDENT, H. T. Orebaugh, 1330 Dearborn. SECRETARY, L. F. Christofferson, 7358-58th Ave. N.E., (5).
- **PHILADELPHIA:** 1916. Hdqrs., Philadelphia, Pa. Meets, Second Thursday. PRESIDENT, L. M. Church, 12 So. 12th St. (7). SECRETARY, C. J. Forve, Parkwood Manor, Apt. B-202, State Rd. & Penarth Ave., Upper Darby.
- **PITTSBURGH:** 1919. Hdqrs., Pittsburgh, Pa. Meets, Third Monday. PRESIDENT, E. C. Hach, 221 Broadmoor Ave. (34). SECRETARY, E. H. Riesmeyer, Jr., 231-33 Water St. (22).
- **ROCKY MOUNTAIN:** 1944. Hdqrs., Denver, Colo. Meets, First Wednesday. PRESIDENT, H. L. Wray, 1101 Geneva St., Aurora. SECRETARY, J. F. Cipra, Jr., 2676 S. Madison St.
- **SACRAMENTO VALLEY:** 1952. Hdqrs., Sacramento, Calif. Meets, First Wednesday. PRESIDENT, E. C. McKinsey, 4220 Annette (21). SECRETARY, R. A. Sarro, 5412 Argo Way.
- **ST. LOUIS:** 1918. Hdqrs., St. Louis, Mo. Meets, Second Tuesday. PRESIDENT, G. H. Bemarkt, St. Clair Dr., R.R. 1, Caseyville. SECRETARY, W. P. Norris, 1118 Fullerton Bldg.
- **SHREVEPORT:** 1948. Hdqrs., Shreveport, La. Meets, Third Thursday. PRESIDENT, M. A. Hudson, 753 Gladstone Blvd. SECRETARY, R. S. Segall, 603 Cotton St.
- **SOUTH CAROLINA:** 1954. Hdqrs., Columbia, S. C. PRESIDENT, R. F. Donovan, P.O. Box 5204. SECRETARY, J. E. McMurray, 1639 Blanding St.
- **SOUTH TEXAS:** 1938. Hdqrs., Houston, Tex. Meets, Third Friday. PRESIDENT, E. G. Floeter, Jr., P.O. Box 1657 (1). SECRETARY, F. M. Neil, 3513 W. Dallas Ave. (19).
- **SOUTHERN CALIFORNIA:** 1930. Hdqrs., Los Angeles, Calif. Meets, First Tuesday. PRESIDENT, C. D. Walz, 3600 San Pasqual St., Pasadena (10). SECRETARY, H. F. Ulovec, 3886 Olympiad Dr. (43).
- **SOUTHERN PIEDMONT:** 1952. Hdqrs., Charlotte, N.C. PRESIDENT, R. S. Fullerton, P.O. Box 3697. SECRETARY, J. R. Clark, P.O. Box 1755.
- **SOUTHWEST TEXAS:** 1946. Hdqrs., San Antonio, Tex. Meets, Third Tuesday. PRESIDENT, L. H. Hornor, Jr., 816 Insurance Bldg. SECRETARY, Boone Crisp, P.O. Box 9065, (4).
- **UTAH:** 1944. Hdqrs., Salt Lake City, Utah. Meets, Third Thursday. PRESIDENT, M. L. Gollaher, 1163 Roosevelt Ave. (5). SECRETARY, G. L. Soderborg, Sr., 42 E. 8th St. S.
- **VIRGINIA:** 1946. Hdqrs., Norfolk, Va. Meets, Third Wednesday. PRESIDENT, H. E. Marquart, 111 W. Main St. SECRETARY, R. L. Burton, Jr., 1913 Lafayette Blvd.
- **WASHINGTON, D. C.:** 1935. Hdqrs., Washington, D. C. Meets, Second Wednesday. PRESIDENT, G. C. F. Asker, 1109 W. Broad St. (16). SECRETARY, C. P. Humke, 5905 Berwyn Rd, Rt. 1, Box 89, College Park, Md.
- **WEST TEXAS:** 1953. Hdqrs., Lubbock, Tex. PRESIDENT, L. C. McKay, 210 Sanford Bldg. SECRETARY, J. C. Wharton, Box 1240.
- **WESTERN MICHIGAN:** 1931. Hdqrs., Grand Rapids, Mich. Meets. Second Monday. PRESIDENT, J. T. Anderson Michigan State College, East Lansing. SECRETARY, N. A. Buckley, 514 Park Rd., Jackson.
- **WESTERN NEW YORK:** 1919. Hdqrs., Buffalo, N. Y. Meets, Second Monday. PRESIDENT, C. W. Stone, 1219 Main St. (9). SECRETARY, C. W. Kaupp, 271 Delaware Ave.
- **WISCONSIN:** 1922. Hdqrs., Milwaukee, Wis. Meets, Third Monday. PRESIDENT, L. C. Plaehn, 914 N. Broadway. SECRETARY, H. W. Alyea, 507 E. Michigan St.

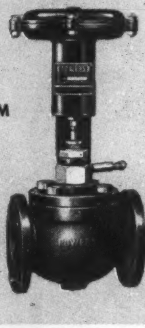
SPECIAL BRANCH

- **SWISS:** 1952. Hdqrs., Zurich, Switzerland. PRESIDENT: Walter Sennhauser, Sulzer Bros., Ltd., Winterthur. SECRETARY, Walter Hausler, Erbstrasse 2, Kusnacht, Zurich.

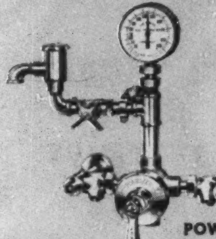
STUDENT BRANCHES

- **NORTH CAROLINA STATE COLLEGE:** 1948. Hdqrs., Raleigh, N. C. PRESIDENT, Norman Falbaum, Box 4668, State College Station. SECRETARY, J. L. Flowers, Apt. 33-E, Vetville.
- **OKLAHOMA A. & M. COLLEGE:** 1950. Hdqrs., Stillwater, Okla. PRESIDENT, C. E. Durrett, 1215 College. SECRETARY, R. M. Jauch, 308½ W. Maple.
- **OREGON STATE COLLEGE:** 1949. Hdqrs., Corvallis, Ore. Meets, First Wednesday after First Tuesday. PRESIDENT, R. E. Bulletset, 252 Kings Rd. SECRETARY, I. P. Parkhurst, 1354 Harrison.
- **PURDUE UNIVERSITY:** 1948. Hdqrs., W. Lafayette, Ind. CHAIRMAN, R. G. Supple, 640 Russell St. SECRETARY, R. E. Jacobs, 1534 Colfax St., Lafayette.
- **TEXAS A. & M. COLLEGE:** 1946. Hdqrs., College Station, Tex. Meets, Second and Fourth Tuesday. PRESIDENT, D. F. Carroll, Box 6264. SECRETARY, C. W. Farrar, Jr., Rt. 1, Box 389, Bryan.
- **UNIVERSITY OF DETROIT:** 1949. Hdqrs., Detroit, Mich. Meets, First Tuesday. PRESIDENT, J. R. Cairns, 4001 Florence, (21). SECRETARY, W. E. Zimmerman, 15359 Lauder (27).
- **UNIVERSITY OF TEXAS:** 1949. Hdqrs., Austin, Tex. Meets, First and Third Tuesday.
- **UNIVERSITY OF TORONTO:** 1951. Hdqrs., Toronto, Ont. CHAIRMAN, Alexander Tudor, 75 South Dr. SECRETARY, T. M. Devine, More House, St. Michaels College.


POWERS
ACCRITEM



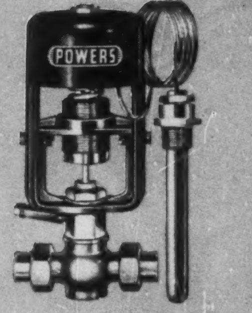
Above: POWERS ACCRITEM Temperature Regulator, is water or compressed air operated. Controls **FLOWRITE** diaphragm valve (right). Widely used for Water Heaters and Industrial Processes.



WARMER
POWERS

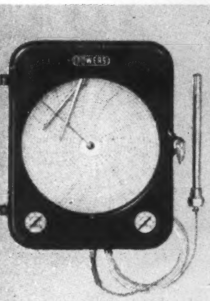
POWERS Type H Thermostatic Water Mixers Insure utmost comfort and safety in showers and other types of baths.

Also used for many processes. Users report ½° F. ± accuracy. Capacities 5 to 10 gpm. @ 45 psi.

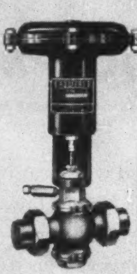


Powers No. 11 Self-Operating Regulator widely used for water storage heaters, heat exchangers, fuel oil preheaters and many industrial processes.

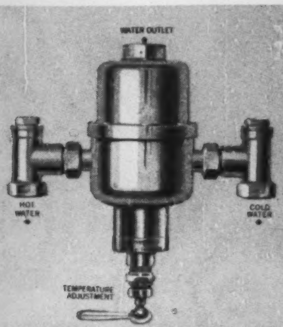
WATER Temperature CONTROL?



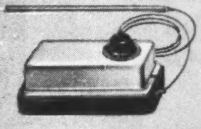
Powers Series 100 Recording Controller. Compressed Air Operated.



POWERS FLOWRITE V-Port-Characterized Diaphragm Control Valve.

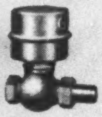

WATER OUTLET
HOT WATER
COLD WATER
TEMPERATURE ADJUSTMENT

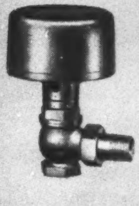
Powers Thermostatic Water Controller for regulating temperature of mulitple type showers, hydro-therapy and industrial processes. Capacities 22 to 125 gpm. @ 45 psi.



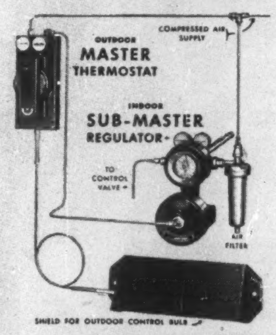
Powers Remote Bulb Type D Thermostat for Unit Air Conditioners.

POWERS PACKLESS VALVES





For controlling chilled, or heated water in unit air conditioners.
No leakage
No packing maintenance


COMPRESSED AIR SUPPLY
OUTDOOR
MASTER
THERMOSTAT
INDOOR
SUB-MASTER
REGULATOR
TO CONTROL VALVE
AIR FILTER
SHIELD FOR OUTDOOR CONTROL BULB

Powers MASTROL Control for regulating forced hot water heating systems.

Call POWERS

Most Complete Line of Controls Made
Only a few are shown here

for All Types of Baths, Water Heaters and Heat Exchangers

- Forced Hot Water Heating Systems
- Radiant Panel Heating Systems
- Air Conditioning Units using Chilled and Heated Water
- Cooling Water for Air Compressors, Diesel, Gas Engines, and Cyclotrons
- **Many Industrial Processes:** Photo Developing, X-Ray, Color and Ordinary Film, Lens Polishing and Grinding, Chocolate Enrobers, Plastic Molding Presses, etc.

POWERS CONTROL

Our More than 60 Years Experience will be valuable in helping you select the right control for your requirements. Contact our nearest office or *Write us direct for Condensed Catalog Rb 24.*

THE POWERS REGULATOR CO.
Skokie, Ill. • Offices in Over 50 Cities
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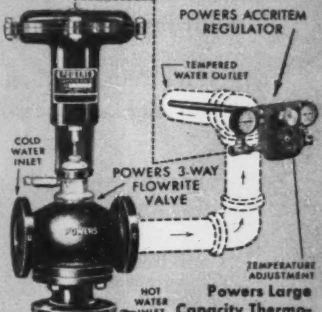
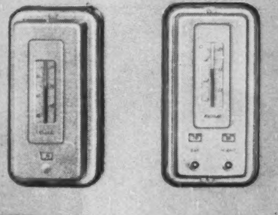
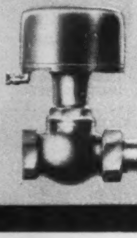

POWERS ACCRITEM REGULATOR
TEMPERED WATER OUTLET
COLD WATER INLET
POWERS 3-WAY FLOWRITE VALVE
POWERS
TEMPERATURE ADJUSTMENT
HOT WATER INLET

Powers Large Capacity Thermostatic Water Mixing Valve Controlled by an ACCRITEM Temperature Regulator. Capacities 20 to 1200 gpm. @ 45 psi.





Powers Room Type Pneumatic Controls for Radiant Heating-Cooling Panels, Convectors and Unit Ventilators. Valves are packless. No more packing maintenance. No leakage.

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"INDOOR WEATHER" that's right for every season and every job... select it from the complete line of

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From a propeller fan installation . . . to a complete heating and ventilating system—you've got everything you need in Herman Nelson products. Right now, it's time to set the stage for summertime efficiency with Herman Nelson ventilating units, fans, and unit blowers.

If it's Herman Nelson engineered, you can be sure it's superior in performance, made for long, economical operation—and styled with beauty that appeals. Out of the vast Herman Nelson line, you can plan all types of heating and ventilating systems for commercial, industrial, institutional needs. AAF branch offices and distributors all over the U. S. offer specialized engineering help and recommendations on specific jobs. Avail yourself of this help. And write for literature on America's foremost line of heating and ventilating equipment!

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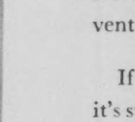
American Air Filter COMPANY, INC.
373 Central Avenue, Louisville 8, Ky.



VERTICAL UNIT HEATER
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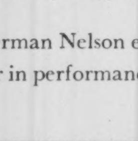

HORIZONTAL UNIT HEATER
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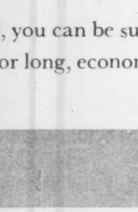

GAS FIRED UNIT HEATER
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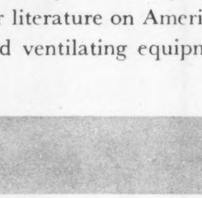

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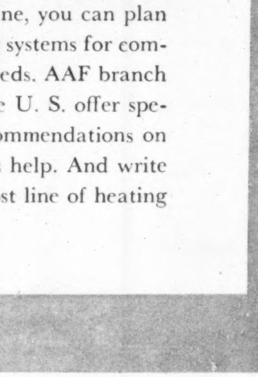

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PROPELLER FANS

Select from a wide range of sizes, wheel diameters from 24" through 54", capacities up to 36,150 CFM. Fans operate horizontally or vertically. Herman Nelson Belt Drive Propeller Fans are quiet-operating—give low initial cost, low operating cost.

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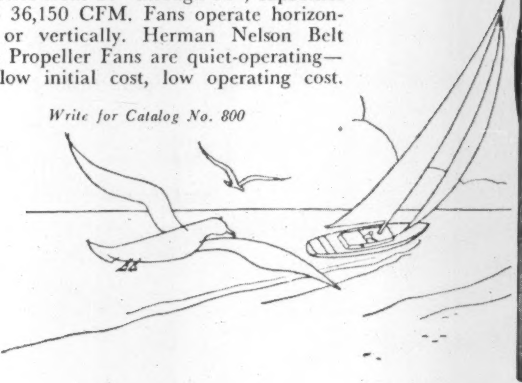

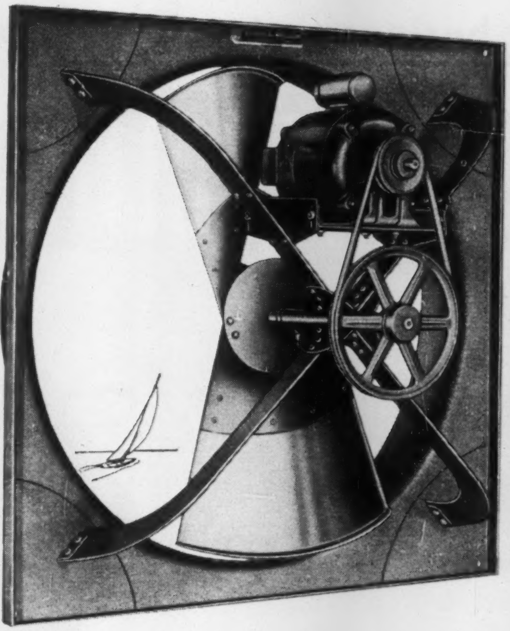

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UNIT BLOWERS

Herman Nelson Unit Blowers handle more air with less horsepower, less noise. Belt Drive Unit Blowers are offered in both slow speed and non-overloading types. Wheel diameters 9" to 30". All Herman Nelson Unit Blowers are available for any discharge and rotation.

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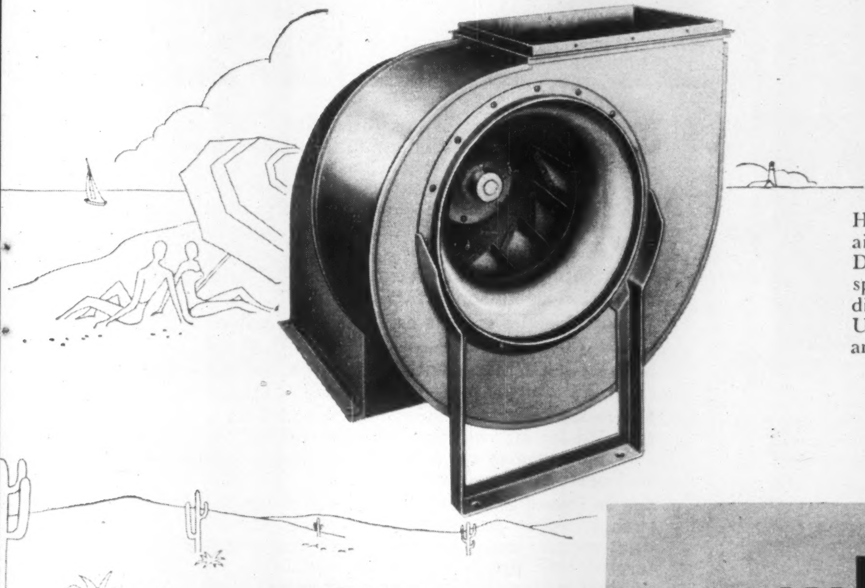

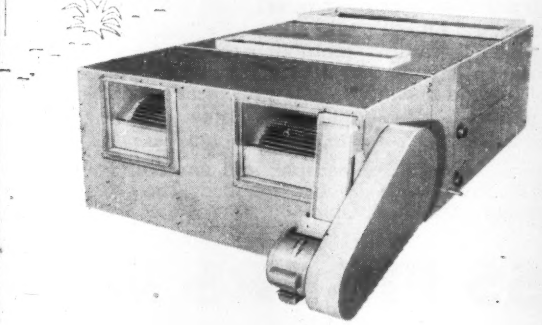

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...plus 3 NEW RADIATION PRODUCTS

HERMAN NELSON FINNED RADIATION

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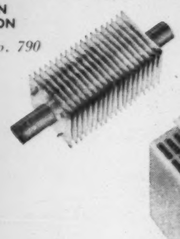

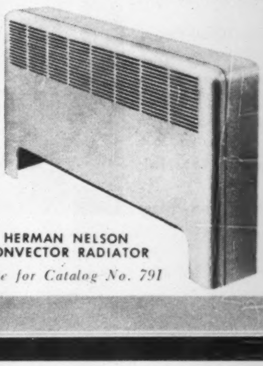

HERMAN NELSON CONVECTOR RADIATOR

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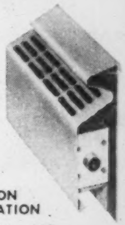

HERMAN NELSON BASEBOARD RADIATION

Write for Catalog No. 792

If your business is insulating ducts, here's important news:

New MICROLITE Duct Liner

coated or
uncoated

a wonderfully soft, light weight, highly manageable glass fiber insulating material with excellent acoustical and thermal properties

1. With knife or shears cut off required length and apply with regular adhesive to sheet metal.

2. Form insulated duct section in the brake in the usual way.

3. Use regular fabricating methods—no special procedure required.

Now, Glass Fibers Inc. brings you a duct liner that is a pleasure to handle and install, and is a highly efficient acoustical and thermal insulator. Chalk up another achievement for Glass Fibers' exclusive Electronic-Extrusion process, which makes possible the long, uniform fibers responsible for the insulating and mechanical superiorities of this new duct liner.

Sound Absorption Value is excellent: ½" liner has a noise reduction coefficient of .60; 1" of .75.

Thermal Qualities are also excellent: "k" value of .20 at 50°, .21 at 75°, .23 at 100°, .27 at 150°, .31 at 200°.

Light Weight: 1" liner with coating on one side weighs less than 2¼ ounces per square foot.

Air Erosion Resistance: Microlite coated duct liner is recommended for air velocities of 1500 feet per minute or over. For movements up to 1500 feet per minute, uncoated will perform satisfactorily.

Can Be Formed in Brake: Cut required length with knife or shears; apply to sheet metal with adhesive; insulated duct section can then easily be formed in the brake. On large ducts, upper surface of horizontal runs should be applied with adhesive plus mechanical clips.

Ready Made Ducts and Fittings: Microlite duct liner can be installed by the "wrap-in" method, using regular adhesives. Precision cutting and fitting of separate pieces, as in the use of rigid insulation, is not necessary.

Microlite Duct Liner is available in 24", 36" and 48" widths; half inch in 200 foot rolls; one inch in 100 foot rolls.

For a technical bulletin and sample, and name of your nearest distributor, write to Glass Fibers Inc., 1810 Madison Avenue, Toledo 2, Ohio.

VITRON Glass Textile Yarns • Rovings • Micro-Fibers
DURAMAT Vapor Barriers • **BLUE FLAG** Pipe Wrap
MICROLITE Thermal and Acoustical Insulation
VIBRAGLASS Mounting and Packaging Materials
COUSTIC-AIRE and **THERMO-JET** Aircraft Insulations

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Makers of glass fibers by the ELECTRONIC-EXTRUSION process
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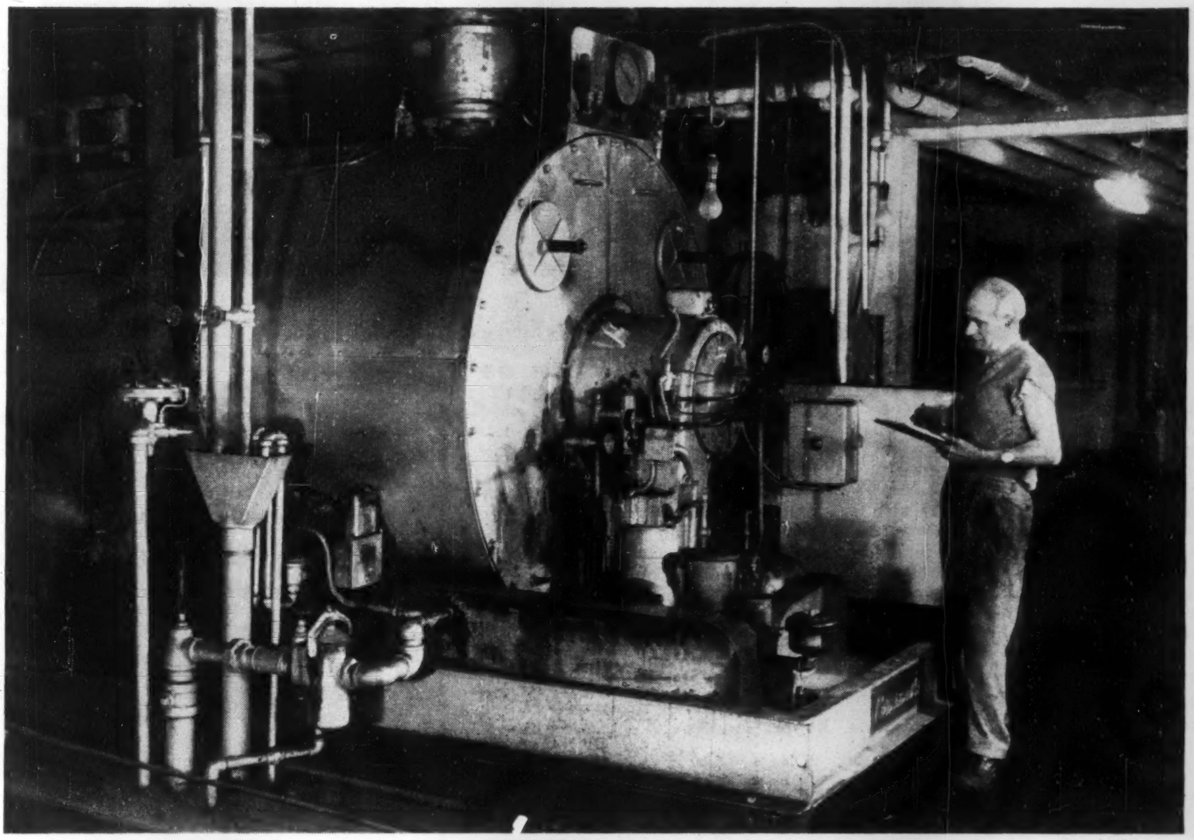
IN HOTELS



Powermaster® Excels in Operating Efficiency!

For example: This large hotel in an Eastern city is supplying heat and hot water for its 300 rooms with this 250 HP *Powermaster* Packaged Automatic Boiler.

High fuel economy at all loads is one reason why *Powermaster* is a byword for operating efficiency among the men who select, install and operate boilers for hotels as well as for institutions, churches, housing projects, all types of buildings . . . and industrial plants.

Other *Powermaster* advantages include: Cost-saving installation, space-saving compactness, fast steaming, hospital-clean operation, dependability, maintenance-saving accessibility, fully automatic operation and safety controls and smokeless combustion.

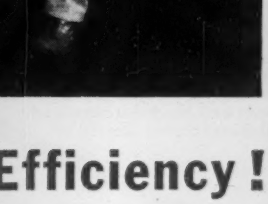
If you're in the market for a boiler, remember—Steam costs go down where *Powermasters* go in. Get the cost-saving story on *Powermaster.* Send now for latest descriptive bulletin.

O&S

Powermaster®

PACKAGED AUTOMATIC BOILERS

In sizes to 500 HP; pressures to 250 psi.



ORR & SEMBOWER, INC. • Established 1885 • **Morgantown Road, Reading, Penna.**

COAL HEAT produced with a WILL-BURT STOKER

IS LOW COST HEAT...

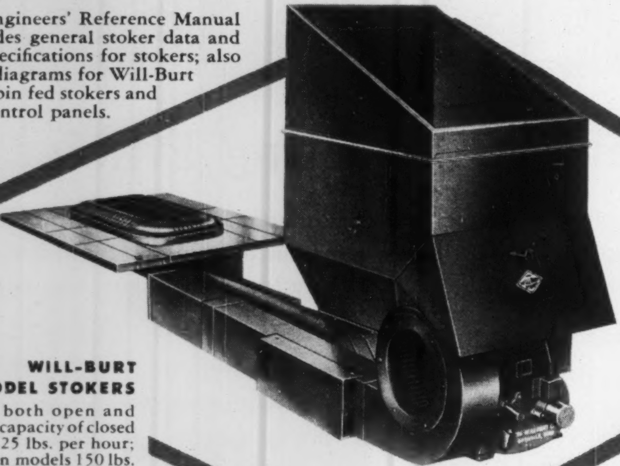
Heat generated by means that assures a factor of greater safety at all times

Will-Burt Stokers give relief from time-wasting grief at the installation stage and throughout the heating season. They are engineered for application to various types of bituminous coal burning boilers and furnaces. They represent over 25 years of experience in designing and manufacturing automatic stokers and are widely known for dependable trouble-free performance, particularly in installations in schools, hospitals, greenhouses, churches, country clubs, apartments and small factory buildings.

Will-Burt Stokers assure efficient combustion under ever-changing fuel bed conditions. The Will-Burt Patented Automatic Air Control delivers correct quantities of air for the most efficient combustion during operating and off periods. Air induced by natural draft through the Automatic Air Control when the blower is idle is sufficient to *prevent a condition of smoke and soot* such as is usually prevalent when the fire is starved for air.

A factor of great safety in automatically controlled heating is assured with Will-Burt Stoker safety devices and control panels. Will-Burt Stokers are available in open and closed hopper models and a bin fed model.

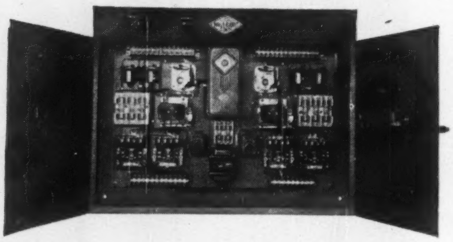
Write for Engineers' Reference Manual which includes general stoker data and suggested specifications for stokers; also installation diagrams for Will-Burt hopper and bin fed stokers and Will-Burt control panels.



WILL-BURT HOPPER MODEL STOKERS

Available in both open and closed models; capacity of closed models 20 to 125 lbs. per hour; capacity of open models 150 lbs. per hour and up to 750 lbs.

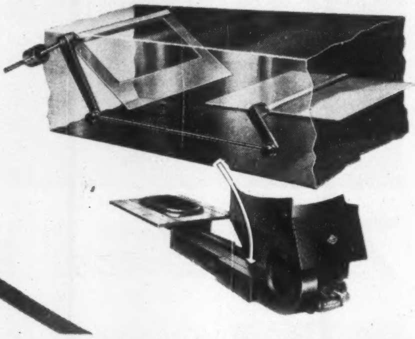
Coal Fired with a Will-Burt Stoker is the Preferred Method of Heating Wherever Safety in Heating is of Utmost Importance



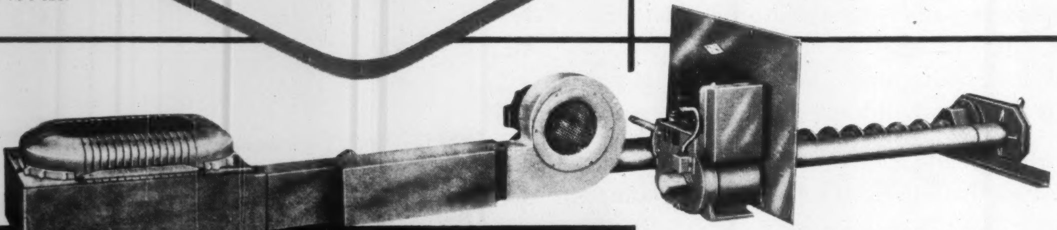
Will-Burt controls provide limiting and operating controls which may be set to obtain maximum efficiency in use of fuel and to coordinate operation of blower, Automatic Air Control and stoker under varying operating conditions. These controls combined with Will-Burt Safety Devices make this method of generating heat a positively safe one—a method preferred for schools, hospitals, institutions, and wherever safety in heating is of utmost importance.

●

Will-Burt Patented Automatic Air Control Assures the Most Efficient Combustion of Bituminous Coal Under Ever-Changing Fuel Bed Conditions



The Automatic Air Control assures proper combustion of fuel during the operating period and also during the time the blower and stoker feed screw are off. Air induced by natural draft through the Automatic Air Control when the blower is idle is sufficient to *prevent a condition of smoke and soot* such as is usually prevalent when the fire is starved for air. The Will-Burt Automatic Air Control allows enough of the normal draft to pass through and into the retort which in turn allows for the dissipation of any intense heat that may be surrounding the tuyeres or dead plate at the time the blower shuts off. This reduces boiler repair cost by retaining more uniform boiler and furnace firebox temperatures.



WILL-BURT BIN FED STOKERS

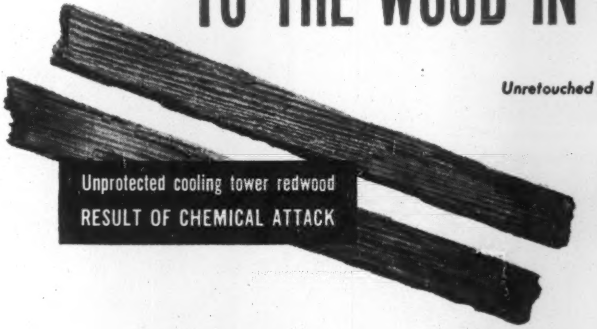
Reduce cost of coal handling and maintenance to an all-time low. Widely used throughout the nation and in several foreign countries with various types of bituminous coal burning boilers and furnaces.

The WILL-BURT Company

OVER TWENTY-FIVE YEARS IN THE STOKER BUSINESS
BOX 902 • ORRVILLE, OHIO

LOOK WHAT CAN HAPPEN TO THE WOOD IN COOLING TOWERS

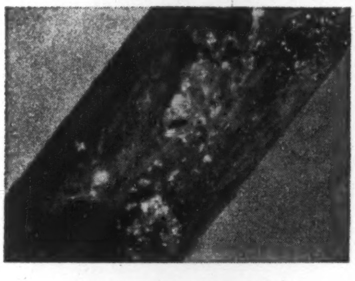
Unretouched photographs



Unprotected cooling tower redwood
RESULT OF CHEMICAL ATTACK

Unprotected cooling tower redwood
RESULT OF FUNGUS ATTACK

PRESSURE CREOSOTING ADDS YEARS OF LIFE TO HALSTEAD & MITCHELL COOLING TOWERS



FUNGUS ROTTED UNPROTECTED DECKING

Unretouched photographs

CLEAN PRESSURE-CREOSOTED DECKING

Examine these unretouched photographs carefully. Constantly wetted wood decking in a cooling tower is subject to immediate attack by fungus and marine parasites. It is also subject to chemical deterioration from acids in water. All wood used in Halstead & Mitchell Cooling Towers is protected against these twin enemies.

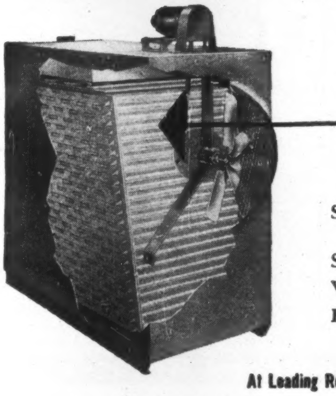
WHY PRESSURE CREOSOTING?

Creosote . . . *with 162 elements toxic to fungus growth and parasites* . . . also makes wood more resistant to chemical attack. Deep penetration of the wood by Koppers Pressure-Creosoting gives the longest possible wetted decking life. Therefore, all Halstead & Mitchell Cooling Tower decks are Pressure-Creosoted, and are guaranteed against rotting due to fungus growth . . . for 20 years!

ONLY HALSTEAD & MITCHELL OFFERS THE

20-Year Guarantee!

ON THE WETTED DECK SURFACE against rotting by fungus attack



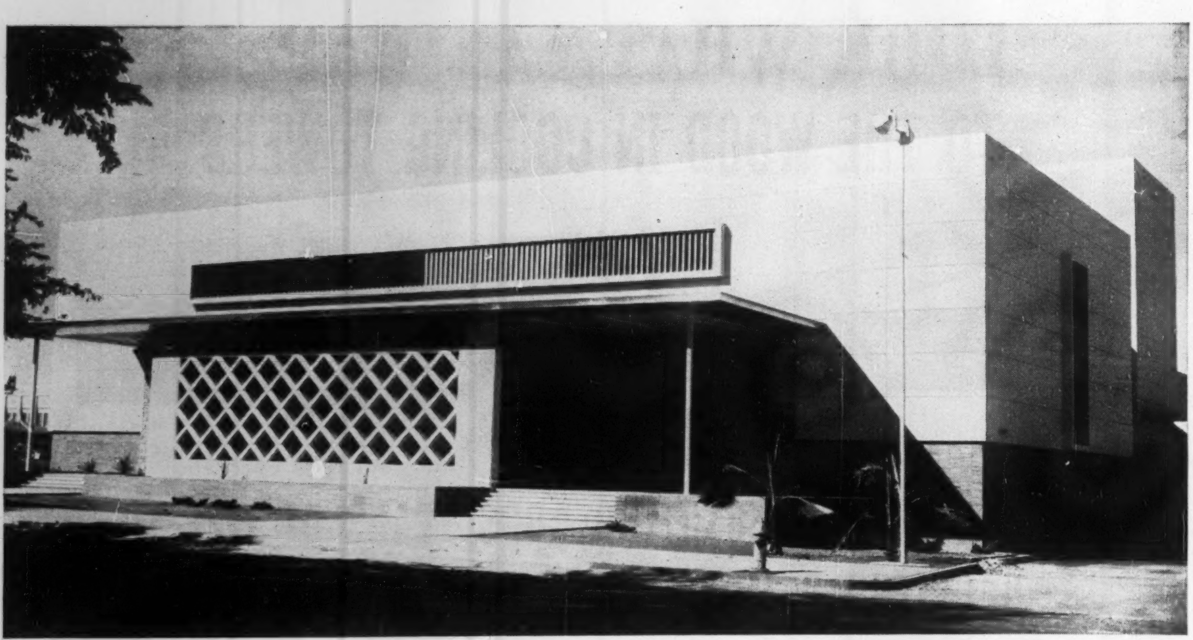
2 thru 100 Tons

Sheet-Steel Cabinets,
5-times protected
Stainless Steel Fans and Shafts
Weather Shielding
Everdur Bolts for ease of
disassembly at any time.

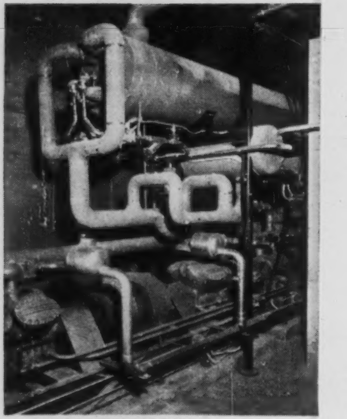
HM
Halstead & Mitchell

At Leading Refrigeration & Heating Wholesalers Everywhere

OFFICES: Bessemer Bldg., Pittsburgh 22, Pa.



Acme air conditioning goes to school



Architect: Claude Beelman
Contractors: Lembke, Clough & King
Refrigeration Installation: Western Heating and Ventilating Co.

1500 Seat Las Vegas High School Auditorium Uses 6 Acme Units in 160 Ton System

Las Vegas Union High School's new million dollar auditorium illustrates the advances in school design that have been taking place over the past few years. More and more the approach has been to provide facilities that make the local school a center for community activities. In addition to having a seating capacity of 1500, this auditorium is equipped with ultra-modern stage facilities, a spacious lobby, large office space, band practice rooms, a Board room and a warehouse.

The entire building is air conditioned with refrigeration and hot water heating. 480 GPM of water, chilled from 58° to 50° for the 160 ton cooling load, is provided by one 60 ton and one 100 ton Acme Dry-Ex Water Chillers. Condensing and water convervation for the system is provided by a 160 ton Acme Evaporative Condenser. To improve overall system efficiency, 2 Acme heat exchangers and an Acme Liquid Receiver have been installed.

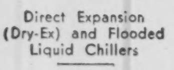
ACME
AIR CONDITIONING
REFRIGERATION

ACME INDUSTRIES, INC.

Mfgs. of a complete line of Air Conditioning and Refrigeration Equipment

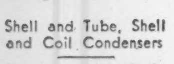
JACKSON, MICHIGAN

Evaporative Condensers
Cooling Towers
Floor-type Unit Coolers



Direct Expansion (Dry-Ex) and Flooded Liquid Chillers

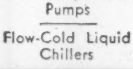
Heat Exchangers, Oil Separators



Shell and Tube, Shell and Coil Condensers

Receivers, Pipe Coils

Packaged Liquid Chillers to 225 tons



Flow-Temp Heat Pumps

Flow-Cold Liquid Chillers

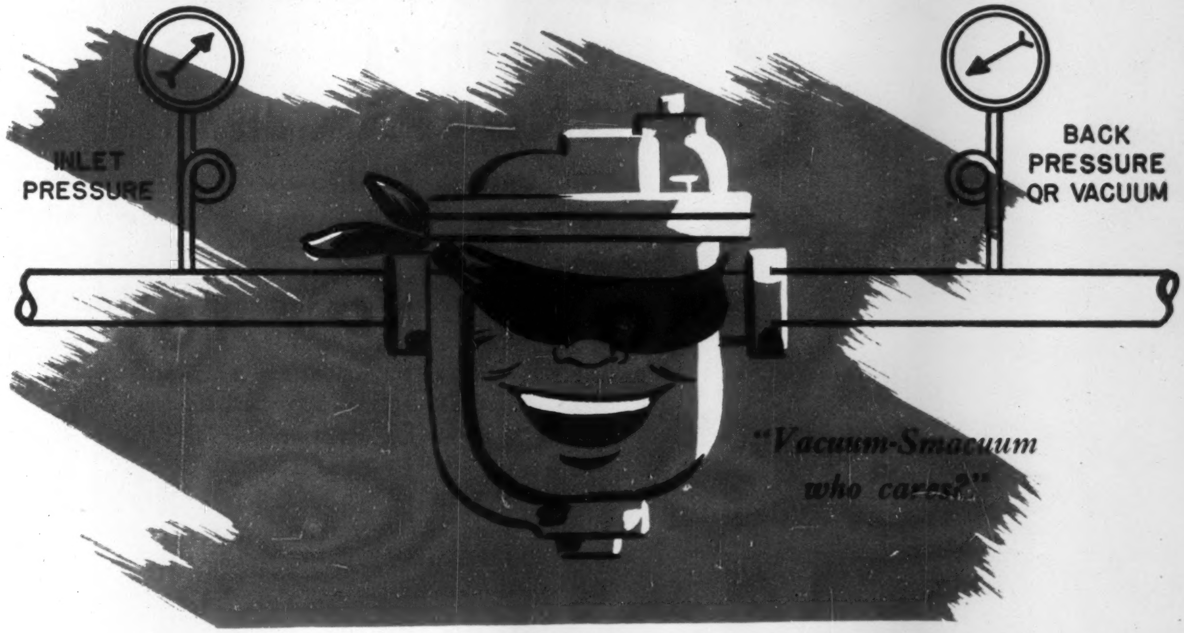
Remote Room Conditioner

Continuously serving the air conditioning and refrigeration industry since 1919

VACUUM ISN'T VACUUM

TO A STEAM TRAP

...It's Just Pressure Below Atmospheric



ONLY 2½¢ per year per trap parts costs on traps averaging 11 years of service at Globe Steel Tubes Company, Milwaukee, Wisconsin.

***PRACTICALLY ZERO maintenance*, complete satisfaction with traps after 12 years service on 10 lbs. pressure, 5" vacuum—Liquid Veneer Corp., Buffalo, N.Y.**

***Send for 4-page Bulletin No. 223, "Vacuum Isn't Vacuum"—a complete discussion of vacuum, effect on trap selection, causes of vacuum loss, effect of flash steam, etc. Free on request. Just fill in and mail the coupon.**

BUYERS are sometimes told that steam traps for vacuum return service must be "different"—requiring, we suppose, some mysterious ability to recognize vacuum and act accordingly.

The truth is that vacuum isn't vacuum to any steam trap. It is just pressure below atmospheric pressure. All vacuum does is increase the pressure differential across the trap orifice. An Armstrong trap doesn't care whether it discharges to vacuum, back pressure or atmosphere. It works just the same in all cases.

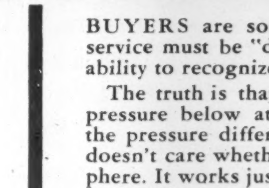
Because Armstrong traps don't have to wait for condensate to cool, drainage is fast and equipment temperatures and BTU output are maximum.

Armstrong traps won't cause you to lose vacuum. Any flash steam from their discharge is quickly condensed. *It is the leaky traps that make it hard to hold vacuum!*

The mechanisms in Armstrong traps for low pressure vacuum return service are identical in design, workmanship and materials to those used in traps for 900°F, 950 lbs. pressure. They can't help but operate a long, long time without leaking. This makes it nice for the maintenance man, too.

Fast heat-up, high temperatures, low maintenance, long life—all wrapped up in one package. Ask your Armstrong Representative to go over your vacuum heating system with you.

ARMSTRONG MACHINE WORKS
874 Maple St., Three Rivers, Michigan



ARMSTRONG MACHINE WORKS
874 Maple St., Three Rivers, Michigan
Please send Bulletin 223, "Vacuum Isn't Vacuum"

Name______________________________

Company____________________________

Street Address_______________________

City________________ Zone____ State________

LAU *Announces the New*

Series "A"
ECONO • PAK Blower

The Unit that features Flexibility and Economy

Here is a new and practical way to reduce your blower inventory as much as 50%—and eliminate slow-moving stocks. Lau Series "A" ECONO • PAK Blowers cover 95% of the blower applications for residential air-moving equipment.

This unit in two basic sizes (each size available in two widths) incorporates all the standard Series "A" features and offers possible savings of as much as 10% per unit.

The reasons for these economies are:

1. The two housing supports and the motor mount bracket are not attached to the unit, but are included in the package with all necessary hardware. You can quickly and easily adjust the discharge to any one of five positions.

2. By the use of exclusive LAU-PAK Bearings, without oil cups and requiring no lubrication, you can adjust the discharge angle at will, without the oil cup problem.

For Present Users of Parts—this "package" will replace expensive inventories of many unassembled parts.

For Buyers of Complete Assemblies—this unit gives you adequate, flexible stock of blowers suitable for many applications—with minimum labor.

These units are being stocked and warehoused for fast delivery . . . it's the answer to your problems!

Note these advantages:

- You continue to get famous Lau basic design and quality engineering features.
- Eliminates special blowers for each application.
- Simplifies order procedures and stock control.
- Enables you to more quickly handle model changes in production.
- Solves many other problems that can cause production delays.
- A more compact package (26½% smaller) that reduces warehouse space.
- Lowered handling costs, particularly for parts buyers.

Write today for Full Information . . . Request Catalog 707-25-26

THE LAU BLOWER COMPANY • Dayton 7, Ohio

LAU World's Largest Manufacturer of Air Conditioning Blowers

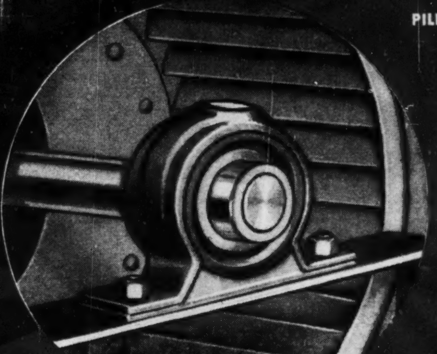
Runs Quieter . . . Locks Tighter

the NEW

Rubber Mounted-Zone Hardened

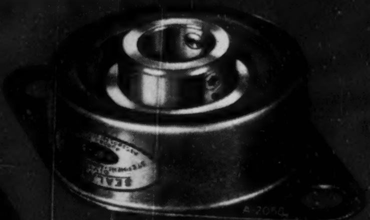
SEALMASTER BEARING UNITS

Talk about silent operation and smooth performance! SEALMASTER engineers have done it again! This *new* Rubber Mounted, Zone Hardened Ball Bearing Unit has all the features the air-conditioning industry has been looking for. Designed to reduce noise and vibration a Zone Hardened SEALMASTER Ball Bearing Unit is mounted in a synthetic, oil-resistant rubber ring which fits snugly into a pressed steel housing. (Cartridge units available for insertion in special and built-in housings). The result is a bearing unit which when built into your product affords you a distinct competitive advantage and a plus feature for your sales story.



PILLOW BLOCK

FLANGE UNIT



CARTRIDGE UNIT

SEALMASTER

SEALMASTER

BALL BEARING UNITS

REDUCE
SEALMASTER

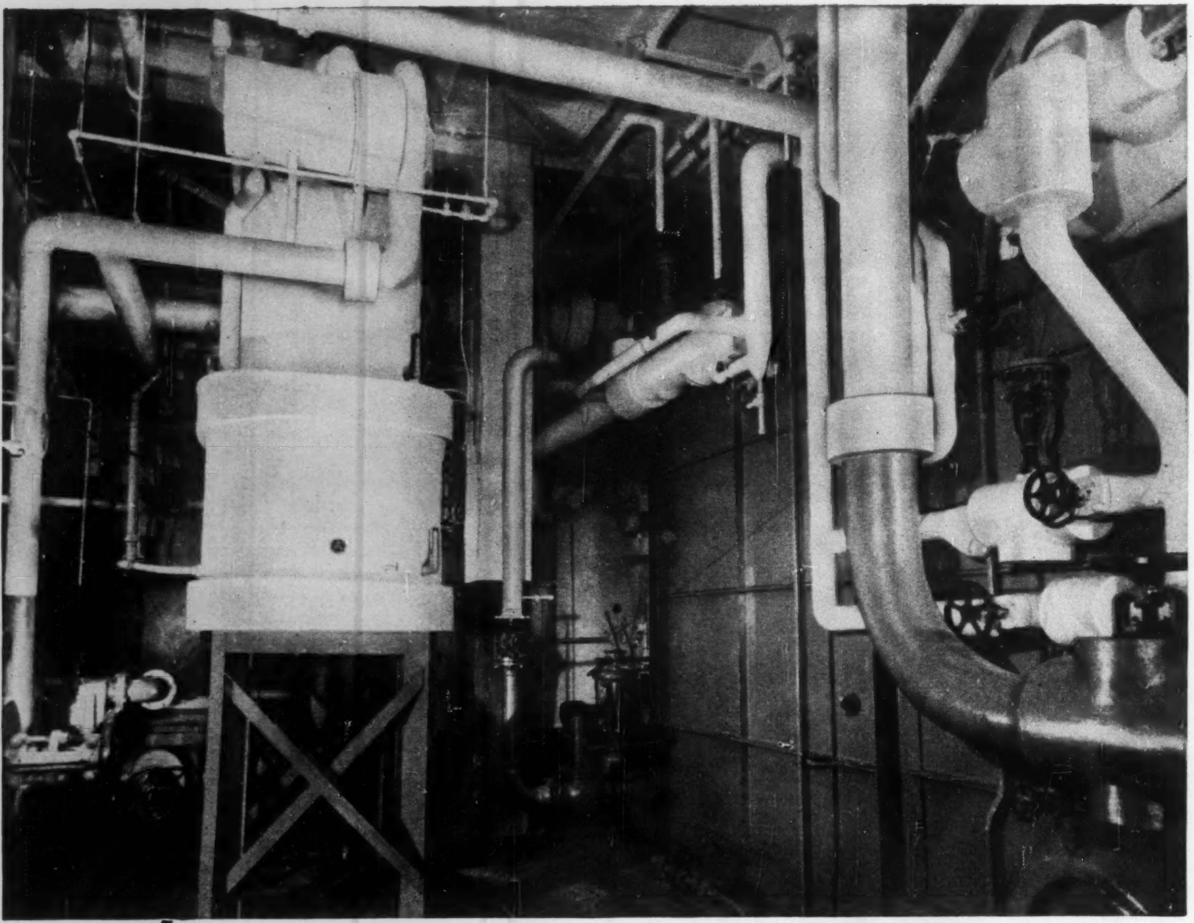
Write for
FREE Bulletin 1253

LUBRICATED AT PLANT

SEALED FOR LIFE

SEALMASTER BEARINGS

A DIVISION OF STEPHENS-ADAMSON MFG. CO.
47 RIDGEWAY AVENUE, AURORA, ILLINOIS



Feed water heater and main steam line insulated with "Featherweight" 85% Magnesia. Rice Hotel, Houston, Tex.

ANOTHER PROFITABLE APPLICATION OF "*Featherweight*"® 85% MAGNESIA INSULATION

"Featherweight" 85% Magnesia is a durable, efficient insulation designed to serve a wide variety of applications. By itself it is effective at insulating piping and equipment with temperatures up to 600°F. In combination with K&M Hy-Temp Insulation (diatomaceous silica) its range is extended to 1900°F.

These time-proved, easy-to-apply insulations will ordinarily last the life of the equipment they serve—withstanding moisture, vibration, and temperature change. You can install them with complete confidence that they will give full customer satisfaction for many, many years.

Ask your plumbing wholesaler to tell you more about these products as well as the many low pressure insulations in K&M's line. See him today, or write directly to us for details.

KEASBEY & MATTISON COMPANY • AMBLER • PENNSYLVANIA

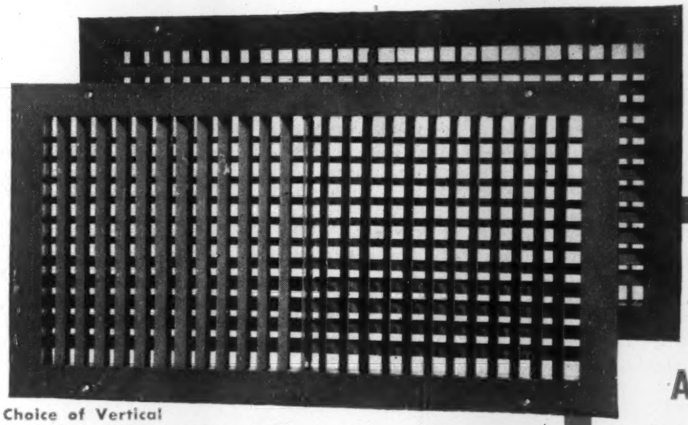
Nature made asbestos . . . Keasbey & Mattison has made it serve mankind since 1873

K&M best in asbestos ®

Announcing a New Heating and Air Conditioning

GRILLE WITH DETACHABLE VOLUME CONTROL

Increased Directional Control • Eliminates Possibility of Tampering Or Accidental Changes • Meters Air-flow Accurately



Choice of Vertical
or Horizontal front vanes

This new grille embodies features never before available to architects and contractors. It offers increased directional control and tamper-proof regulating, plus unmatched beauty, rugged strength and extreme ease of installation.

The streamlined vanes of extruded aluminum are individually adjustable. Their unique shape has been carefully engineered to divert air and provide greater directional control, and at the same time reduce air resistance to a minimum. This means more delicate and accurate balancing is possible.

Each vane in individually controlled by the use of a special tool, and operates under spring-loaded tension. This practically eliminates any possibility that the deflection pattern can be altered as a result of either an accident or by tampering.

The fully-enclosed, wrap-around frame makes the grille sturdier, more attractive and assures easier, safer installation. Since the entire mechanism is concealed, the possibility of "air-leaks" is eliminated.

Series "400" A-J Grilles (with — or without volume control) are available in any size, with a choice of vertical or horizontal louvers only — or a combination of both, with either louver in front. Both sets of louvers are fully adjustable without removing grille. Grilles may be ordered in prime coat, hammered bronze or metallic gray or any standard finish.

**MATCHING RETURN
AIR GRILLES AVAILABLE**

For More Information — Call or Write

A-J MANUFACTURING CO.
2119 Washington St. Dept. H6 Kansas City 8, Mo.

A-J

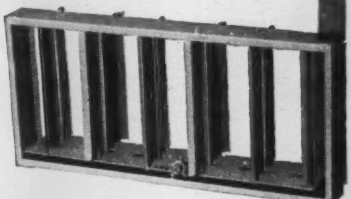
AT LAST!

A Perfected Volume Control Detachable — Easy to Operate Accurately Meters Air-flow from a "Whisper" to a "Full Blast"!

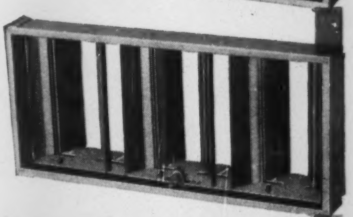
Here's a volume control you can depend on! It meters the flow of air accurately at *every stage* — from fully closed to fully open. There are no "dead spots." The louvers move simultaneously in opposing directions. The gear-driven action assures smooth, easy, uniform operation; and the system may be completely balanced without removing the outer grille.

The volume control is an integral unit, which is available with the A-J Grille #400, or can be quickly installed at any later time in just a few minutes with only a screw driver!

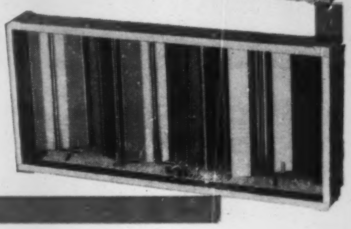
Vanes fully open for maximum air flow



Vanes partially closed to accurately meter desired air flow



Vanes tightly closed for positive shut-off



Sure, that old pump still works,

but how much does it cost to keep?

That rugged old pump of yours may not be the bargain that it seems. Let's do some arithmetic. If the efficiency of the old pump is 75% vs. the 85% efficiency of the new pump, you are paying more to keep it than you would to replace it. That's because a new unit of equivalent output uses less power. Thus it soon saves its own cost — then begins to pay dividends.

Let's take a specific example—a small general service pump

Old pump efficiency 70%	**28.9 BHP**
New pump efficiency 79%	**25.6 BHP**
	3.3 BHP Saving

On the basis of 1¢ per KWH, the 3.3 BHP saving for a 6000-hour year (approximately 16 hours per day) amounts to $150. This saving, capitalized in 4 years at 4% adds up to $630. Yet the price of the new pump that saves $630 is only $438.

What would the pump replacement profit be in your particular case? Your De Laval representative can tell you exactly — in dollars and cents — as soon as he has the basic facts on your present installation. Call him in today or write to De Laval for Pump Fax Bulletin which includes a valuable "power-savings" chart.

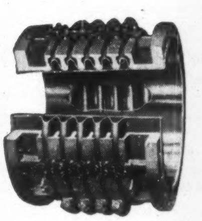
DE LAVAL *Pumps*

DE LAVAL STEAM TURBINE COMPANY
871 ***Nottingham Way, Trenton 2, New Jersey***

DL237A

when the chips are down

When the chips are down
and you must hold a winning hand
to protect expensive piping and equipment
against stress and strain
from expansion and contraction—
play your ace!
Count on Zallea Duo-Equalizing Expansion Joints.
Their life expectancy has been proven
40% to 1800% better than any self equalizing—
or other type of packless—expansion joint made!
So specify—and insist on Zallea!



Zallea already has, or will make, expansion joints for every service. For information on standard types, request Bulletin 351.

For consultation on special problems, ask us to have our representative call.

Zallea
expansion joints

ZALLEA BROTHERS 816 LOCUST STREET, WILMINGTON 99, DELAWARE
World's Largest Manufacturers of Expansion Joints

NEW!
2, 3, 5, 7½-hp sizes
More eye appeal!
More buy appeal!
New styling...
New, handsome finish...
New features

Mueller Climatrol

904 SUMMER AIR CONDITIONER

904 cooling fills the bill better for you and your customer

The 904 built real sales and profits before, for many heating and air-conditioning men. And, now, you can expect even more — from the new, redesigned 904!

It's still a self-contained cooling unit complete with blower — in 2, 3, 5, and 7½-hp sizes. It's ideal for commercial establishments, such as grocery stores, barber shops, drug stores, restaurants, etc. — as well as for radiator- or radiant-heated homes. But now, in addition, it can be equipped with a steam coil for heating as well as cooling. As in the past, the 904 is available with provisions for duct connections, or with return and discharge grilles.

There are other ways the 904 gives you more in '54: It has pleasing, modern styling by Brooks Stevens, world-famous industrial designer. It has a new, handsome, smooth finish — Mountain Spring Green. All in all, it's everything you'd expect from the Big Name in Heating and Cooling.

Write for further, detailed information.

D-161

97th Anniversary

Mueller Climatrol

2023U West Oklahoma Avenue • Milwaukee 15, Wisconsin

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- ***INDUSTRIAL AIR CONDITIONING HANDBOOK***

Information on the purpose, cost, design, operation and maintenance of both process and comfort air conditioning systems in manufacturing plants of many kinds. The combined knowledge and experiences of 33 prominent engineers, every one a designer or in direct charge of the largest factory air conditioning systems in operation. This shows other engineers how air conditioning helps speed production, improve products, increase worker efficiency and operate systems economically. 186 pages, $1.50

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A practical manual on fume removal, dust collecting, ventilating and exhaust sysems for industrial plants. Tells how to design correctly and provide for various ventilation requirements . . . make measurements and analyses of fumes, mists and dusts . . . plan exhaust systems, etc. Twenty eminent authorities contributed also to detailed descriptions of systems in actual operation in many plants. 134 pages, $1.50

- ***SNOW MELTING MANUAL***

Complete information on correct design, installation and operation of snow melting systems is offered in this reprint of articles originally published in "Heating, Piping and Air Conditioning." Design data based on a study of—and others' actual experience with—over 100 snow melting systems of all kinds. Applications illustrated, for loading platforms and docks; sidewalks; roads; driveways; marquees; parking areas; runways; railway switches, etc. 20 pages, $1.00

★ ★

Read *Heating, Piping & Air Conditioning* FOR HELP TO SOLVE YOUR PROBLEMS

- You could make no better start toward solving your own problems in heating, piping and air conditioning than by knowing what successful engineers and contractors have done in working out similar problems. In *HEATING, PIPING & AIR CONDITIONING* they discuss actual installations, procedures, equipment, objectives, and how specific problems have been met.

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- Only *HEATING, PIPING & AIR CONDITIONING* adequately covers all three fields each issue. Best evidence is last year's record: 250 feature pages on Heating. . .150 pages on Piping. . .275 on Air Conditioning—total 675 pages, or the equivalent of three books—plus 525 pages in outstanding departments and news.

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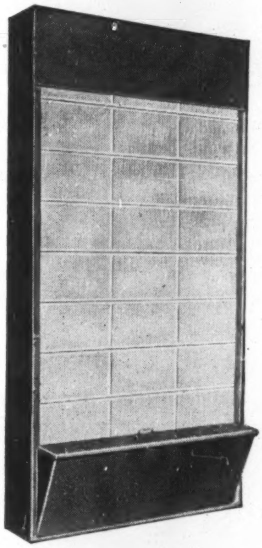
City .... Zone .... State ....

New Automaze air filter stays clean as new–automatically!



EVEN while filtering the dirtiest air, the new Automaze air filter stays clean as new—automatically! The reason is "pulse-type" action—an Air-Maze exclusive. Here's the way it works. While each panel in a revolving curtain is submerged in the cleaning tank at the bottom, it is agitated vigorously 6 or more times by a compressed air drive. This cleans each panel thoroughly as well as completely renewing the adhesive!

New Automaze is a big improvement over stationary filters that may need cleaning once a month. Automaze goes 3 to 6 months without attention. And then all you need do is remove the sludge. A special reservoir cover makes this a quick, simple operation.

Automaze has a rugged but ingeniously simple construction. Filter panels two inches thick are linked in a revolving curtain. Panels move up and over, like the cars on a ferris wheel. As a result, filter panels always keep the same face to the air stream. The dirty face of the filter is never on the downstream side. There's no possibility of dirt being blown off the filter into the cleaned air.

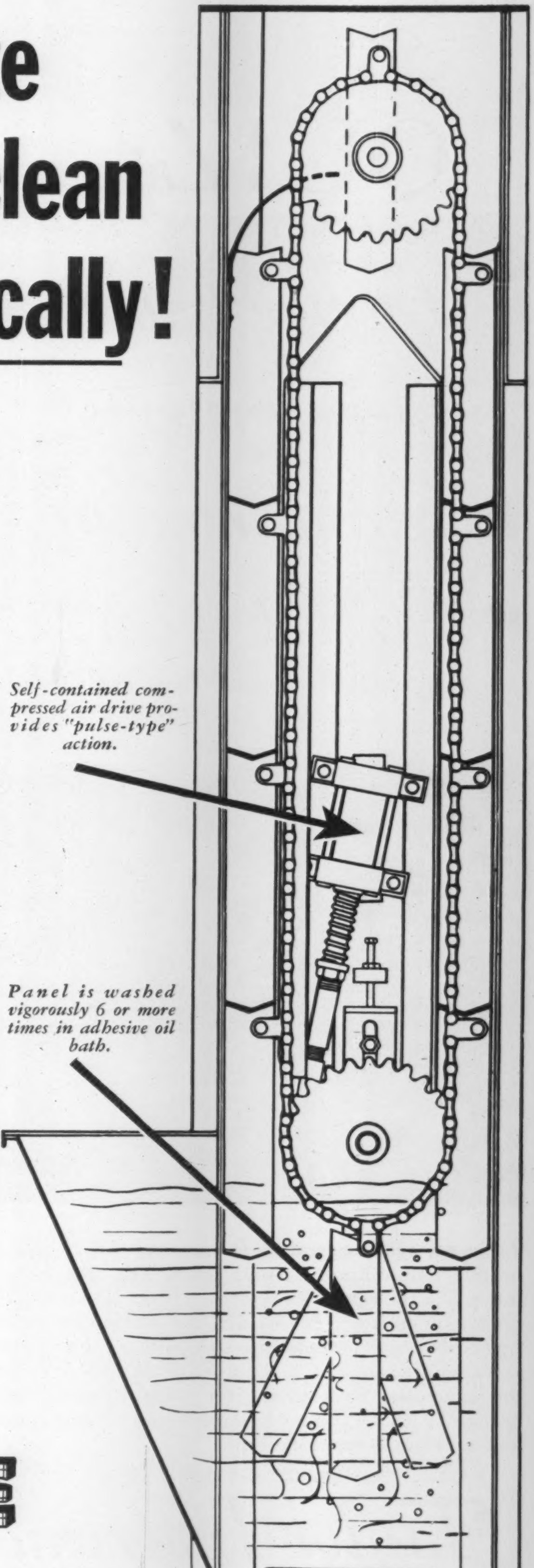
Here are some other important Automaze advantages: 1) Automaze has no electrical connections located in the air stream. 2) If desired, the Automaze control system can be remotely located. 3) A variety of media designs is available to meet different filtering conditions. 4) When sections are bolted together, there's no need for rigid mechanical drive connections that sometimes cause alignment difficulties—each filter section contains its own drive mechanism.

For the full story of the new Automaze, send for a free catalog. Air-Maze, the filter engineers, are specialists in all types of air and liquid filtration. We draw from over 29 years experience and thousands of different filter applications. So for help with your filter problems, contact your nearby Air-Maze representative or write The Air-Maze Corporation, 25000 Miles Rd., Cleveland 28, Ohio.

AIR-MAZE

The Filter Engineers

AIR FILTERS • SILENCERS • SPARK ARRESTERS • LIQUID FILTERS
OIL SEPARATORS • GREASE FILTERS

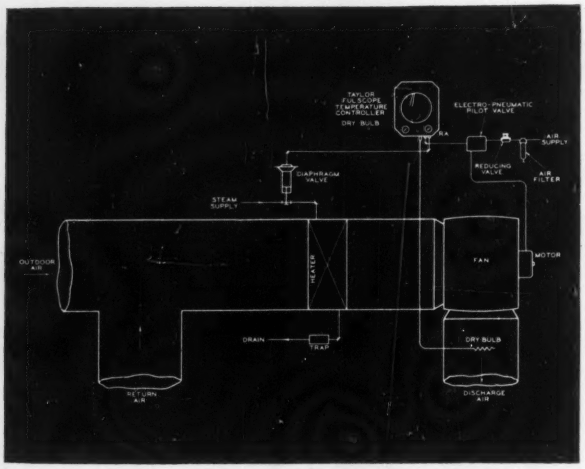


Self-contained compressed air drive provides "pulse-type" action.

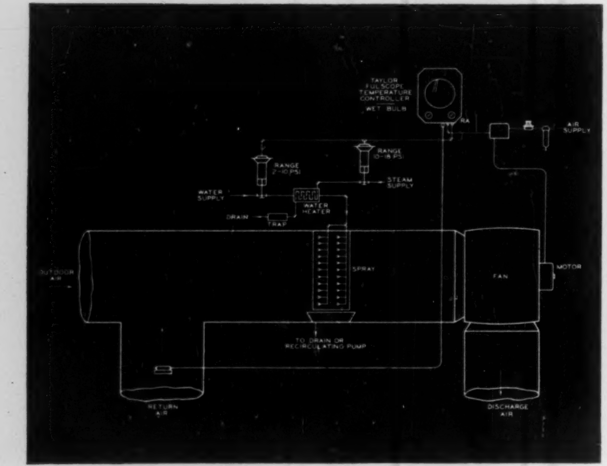
Panel is washed vigorously 6 or more times in adhesive oil bath.

QUIZ:

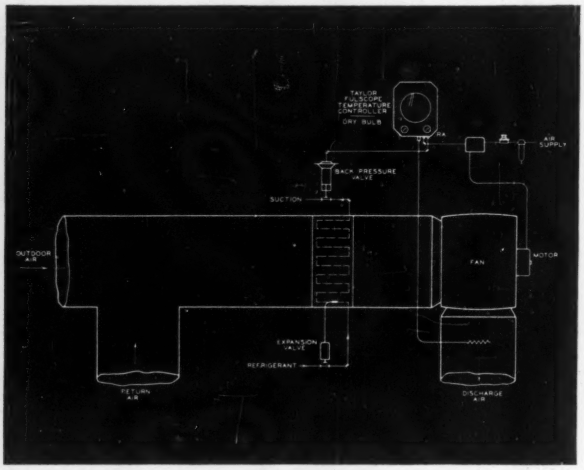
Do you know these systems ...and how to control them?


TAYLOR FULSCOPE TEMPERATURE CONTROLLER
DRY BULB
ELECTRO-PNEUMATIC PILOT VALVE
RA
AIR SUPPLY
REDUCING VALVE
AIR FILTER
DIAPHRAGM VALVE
STEAM SUPPLY
OUTDOOR AIR
HEATER
FAN
MOTOR
DRAIN
TRAP
DRY BULB
RETURN AIR
DISCHARGE AIR

1. This is one of the simplest types of steam heating applications. Outside or return air is pulled through the heater and discharged into the room. The temperature sensitive element is located on the discharge side of the fan where the air is mixed and a reliable average temperature can be measured. A Taylor reverse acting controller adjusts an air-to-open valve in the steam supply line to the heater to maintain a constant discharge air temperature.


TAYLOR FULSCOPE TEMPERATURE CONTROLLER
WET BULB
RA
AIR SUPPLY
RANGE 2-10 PSI
RANGE 10-18 PSI
WATER SUPPLY
STEAM SUPPLY
WATER HEATER
DRAIN
TRAP
OUTDOOR AIR
SPRAY
FAN
MOTOR
TO DRAIN OR RECIRCULATING PUMP
RETURN AIR
DISCHARGE AIR

2. The dry bulb temperature is assumed to be constant in this humidification application. The wet bulb is located in the return air duct and when it shows a decrease of moisture in the air, the Taylor controller opens the water supply line by operating a diaphram valve with a range of 2 to 10 psi. If this doesn't bring the controller back to the set point a second valve (range 10-18 psi) opens to raise the water temperature and accelerate vaporization.


TAYLOR FULSCOPE TEMPERATURE CONTROLLER
DRY BULB
RA
AIR SUPPLY
BACK PRESSURE VALVE
SUCTION
OUTDOOR AIR
FAN
MOTOR
EXPANSION VALVE
REFRIGERANT
RETURN AIR
DISCHARGE AIR

3. This system cools and dehumidifies. A back-pressure valve is adjusted to maintain proper air temperature. If the air temperature rises, the Taylor FULSCOPE* Temperature Controller causes the back-pressure valve to open, reducing pressure in the coil. If moisture content is being controlled a wet bulb controller is used to adjust the back-pressure valve.

Write for Catalog 5. Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.

*Reg. U. S. Pat. Off.

Taylor Instruments MEAN ACCURACY FIRST

IN HEATING, HUMIDIFYING AND COOLING

"I'll come to the point— how about the order?"

"THAT'S right, Mr. Brown! I'd like that order. And I'd like to tell you more about our special equipment and facilities. When you give us an opportunity to see the plant like this, we can point out other ways to help you cut costs."

"That's what we're looking for, Jim."

"Well, over there's a perfect spot for Wolverine Trufin*. That's our integral finned tube, you know. That feature alone is important because—as the fins are part of the tube—Trufin will stand up under the shock of extreme vibration, temperature changes, or high pressures. Yes, and it will give you increased surface area—let you design a smaller shell—a lighter, more compact unit."

"And then there's our Spun End Process†. That's another Wolverine exclusive. By spinning we're able to close or partially close one or both ends of tubing. And do it in one operation, too!"

"Say that one-operation part sounds terrific. It should cut costs to ribbons."

"It does, Mr. Brown. Because in that one operation we can also reduce or neck-down the part. On such fabricated items as accumulators, driers, and other spun-end bulbs, it eliminates press work, reduces assembly time and cuts man-hours."

It adds up: Yes, it adds up to Tubemanship—the one-word picture of Wolverine's skill and facilities. More information? Write today for Wolverine's Statement of Scope. Fast service on an order? You'll get it—*for sure!*

WOLVERINE TUBE DIVISION of Calumet & Hecla, Inc.,
1461 Central Avenue, Detroit 9, Michigan.

*REG. U.S. PAT. OFF. †A PATENTED PROCESS RE. 22465

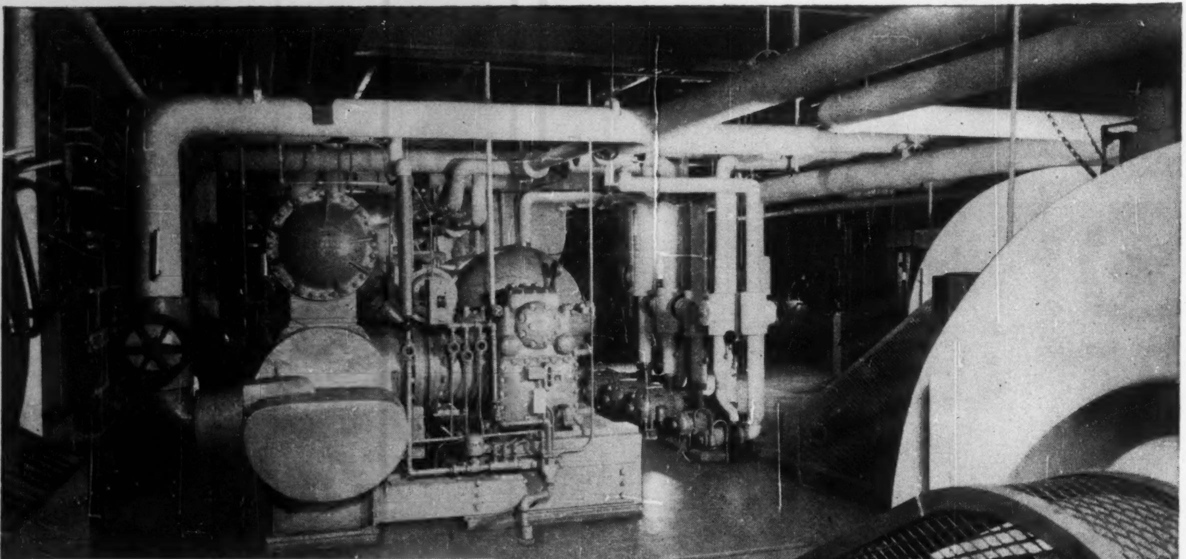
Wolverine Trufin available in Canada through the Unifin Tube Co., London, Ontario.

W EST. 1916

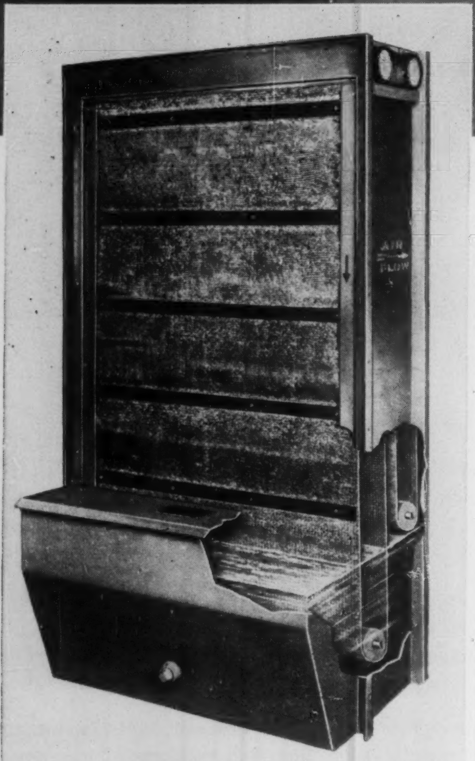
WOLVERINE TUBE DIVISION
OF CALUMET & HECLA, INC.
Manufacturers of Quality-Controlled Tubing

PLANTS IN DETROIT, MICHIGAN, AND DECATUR, ALABAMA • Sales Offices In Principal Cities

Export Dept., 13 E. 40th St., New York 16, N.Y.



Equipment room of Neisner's Rochester, N. Y. store where conditioned air is filtered in 3 units, each consisting of 2 sections, of Staynew Automatic Filters.



STAYNEW Automatic
Self Cleaning Type Filter

Where Automatic Filters are used Neisner's Specify STAYNEW For Air Conditioned Stores

More consistent filtration . . . more efficient operation . . . more effective control of dirt and dust in sales area than conventional filters. *ALL* good reasons why Neisner Brothers Inc., national retail chain, specified Staynew Automatic Air Filters in their large post war stores.

Staynew Automatic Air Filters adapt themselves to all types of air conditioning systems—cooling, either by direct expansion or chilled water; heating, or refrigeration. Self cleaning and easily supervised by laymen, Staynew Automatics stay on the job 24 hours a day at peak efficiency.

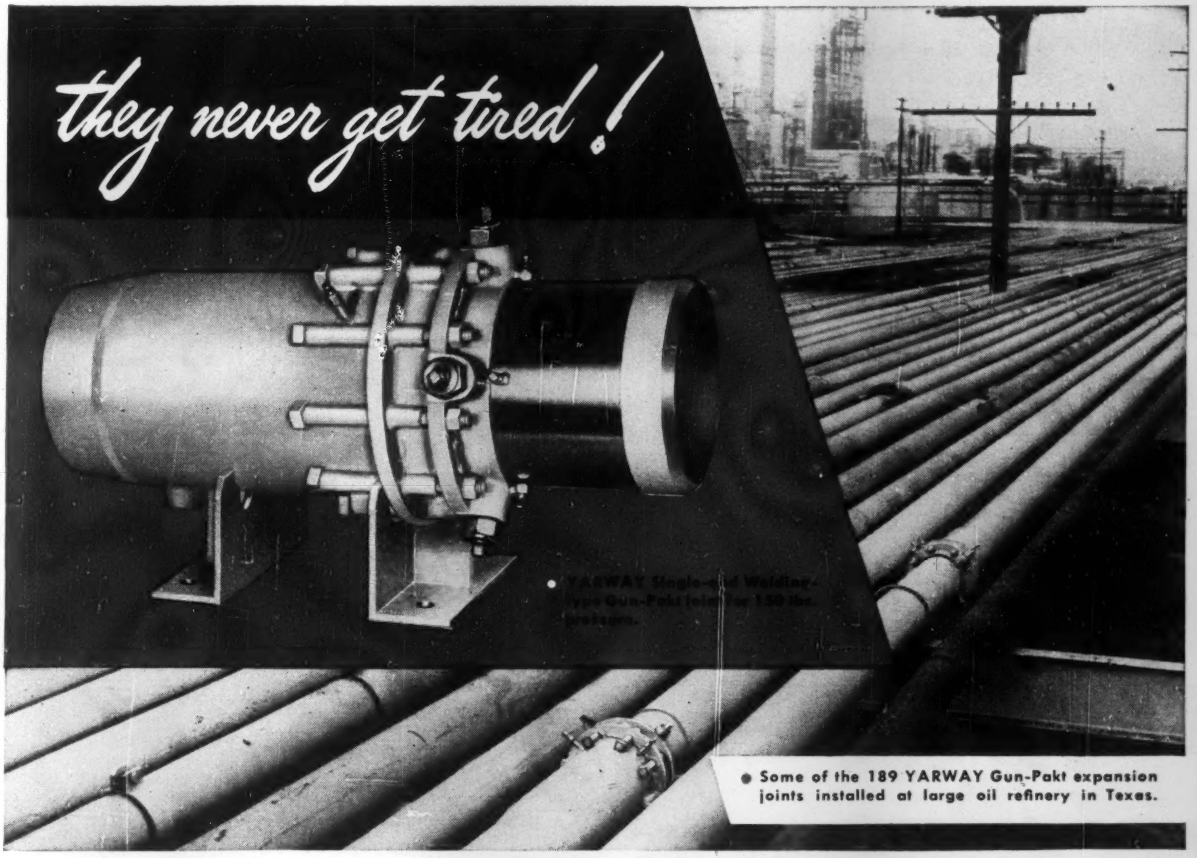
Let Staynew show you how to filter larger volumes of air at *lower* cost. Write for descriptive folder.

REPRESENTATIVES IN PRINCIPAL CITIES

DOLLINGER
REG. U.S. PAT. OFF.
PROTECTOMOTOR
STAYNEW FILTERS

DOLLINGER
CORPORATION
9 Centre Pk., Rochester 3, N. Y.

ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED



• YARWAY Single-end Welding-type Gun-Pakt joint for 150 lbs. pressure.

• Some of the 189 YARWAY Gun-Pakt expansion joints installed at large oil refinery in Texas.

No fatigue with 189 YARWAY GUN-PAKT EXPANSION JOINTS at this large Texas refinery

THEY just work and work for years and never get tired. Yarway Gun-Pakt slip-type joints simply will not fail through fatigue. They will operate smoothly, as frequently as required, over long, full traverse up to 12″ single type or 24″ double type or short, partial traverse, day in and day out—with never any danger of metal fatigue or failure.

This is just one of the many big advantages found in Yarway Gun-Pakt expansion joints. Other outstanding Gun-Pakt features are:

1. Can be serviced under *full* steam pressure day and night, thus avoiding costly and inconvenient shutdowns.
2. Fixed Gun-Pakt gland serves as "built in" external guide and permits less costly and rigid pipe guidance than required by many other types of joints.
3. Lower pressure load on end anchors because excessive strains are eliminated.

Used for many years with success in well-known refineries, industrial plants, utilities and institutions. When replacing present joints or planning new steam lines, it will pay you to look into the advantages of the Yarway Gun-Pakt expansion joint. Write for Yarway Bulletin EJ-1913.

YARNALL-WARING COMPANY
107 Mermaid Avenue, Phila. 18, Pa.
BRANCH OFFICES IN PRINCIPAL CITIES

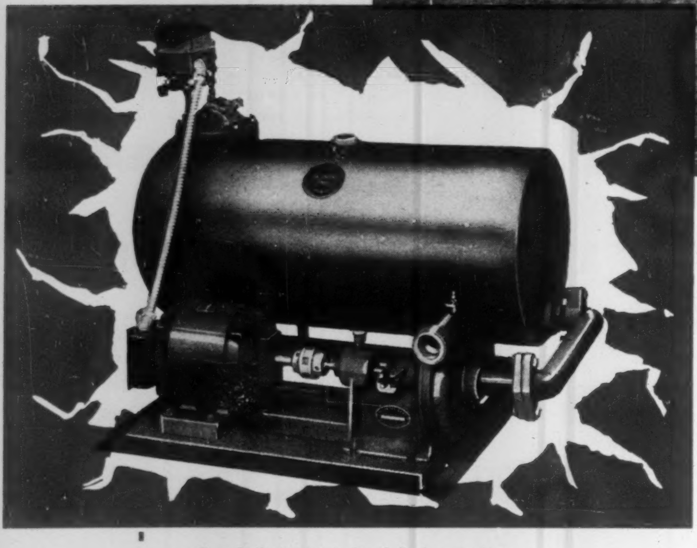
YARWAY®

gun-pakt expansion joints

CAUSE FOR ACTION!

PUMPS
NEEDED
IN A
HURRY . . .

UNITED STATES AIR FORCE



See Bulletin 14-A for full description of this outstanding Skidmore Pump.

AIR FORCE RUSHES SHIPMENT TO BASE

ABOVE: Two-motor cargo plane lands at local air field to pick-up rush shipment of ten Skidmore "HS" boiler feed pumps, needed at once, by east coast air base.

Here again, "proven performance" was the answer . . . when the Army needed a dependable, low cost pump in a hurry — they specified the Skidmore Type "HS" Pump. Yes, the Army knew from past experience what they were getting — and how soon. Take the *guess work* out of your pump program . . . specify a dependable Skidmore Pump on your next installation.

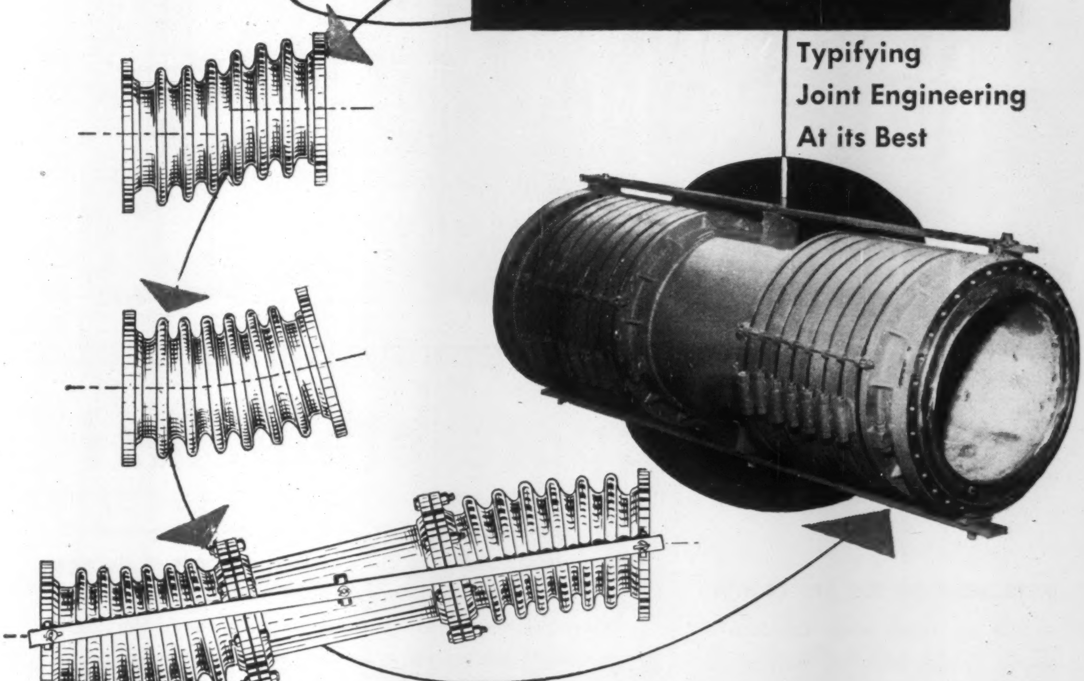
SKIDMORE
PUMPS

SKIDMORE CORPORATION • St. Joseph, Michigan

Badger

EXPANSION JOINTS

Typifying
Joint Engineering
At its Best



DESIGN FOR COMBINATION LINEAR-SHEAR-LATERAL MOVEMENTS

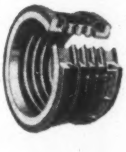
Study these sketches showing (somewhat exaggerated, of course) several of the more complex movements to which expansion joints are often subjected. Do you have such pipe line conditions? Do you have any installation coming up that might involve such movements?

Here's the Badger Joint that is designed for just such a problem: the TANDEM JOINT. It's available in both Self-Equalizing and Non-Equalizing design. The joint movement is controlled by the tandem bars pivoting on a pin in the connecting nipple. Permissible shear or lateral movement depends upon the overall length as well as the number of corrugations in each unit. Each tandem unit is designed to suit the individual job requirements.

The Tandem Joint is but one of several special types designed for complex pipe line movements. We'll be glad to study your problem and make recommendations. Should yours be a straight linear traverse—as most installations are—we have a wide range in Directed Flexing, Self-Equalizing and Non-Equalizing Joints made of copper or stainless steel, with flanged or welding ends.

Badger Expansion Joints come in a variety of types and a wide range of sizes: Directed Flexing, Self-Equalizing for longer traverses and higher pressure; Non-Equalizing, for shorter traverse or when pressures are low. Tandem Joints for combination axial and lateral movements; Clevis Joints for angular rotation.

Special Vibration Control Joints; Flexible Pipe Line Seals for watertight connection between pipe and flood walls.

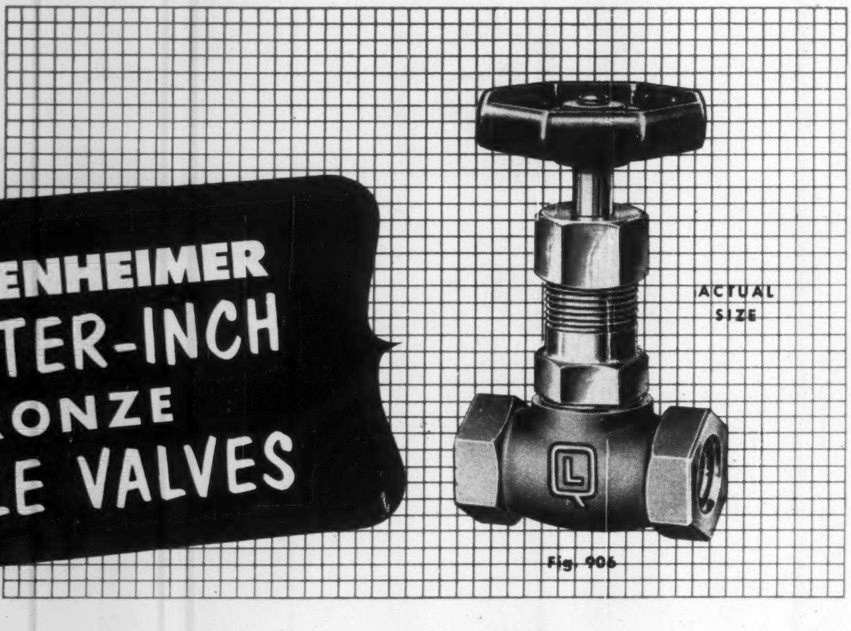


BADGER MANUFACTURING COMPANY

Original and Sole Manufacturer of Badger Expansion Joints

230 BENT STREET • CAMBRIDGE 41, MASS.

NEW LUNKENHEIMER QUARTER-INCH BRONZE NEEDLE VALVES



Solve your space problems!

INSTRUMENT BOARDS ARE CROWDED — and up until now, the size of needle valves installed behind instrument panels has been a serious problem. But this revolutionary new quarter-inch valve *saves as much as 20% in size* — yet is actually stronger than the conventional design.

LUNKENHEIMER
L
QUALITY

BRONZE • IRON • STEEL

It's safer, more accurate, and more compact — easier to install and maintain! The reason: the body of the new figure 906 is carefully machined out of a cast block of close-grained bronze. It gives you all three of the "most wanted" needle valve features — great strength, compact size, and absolute accuracy of flow control.

Figure 906 is available in a wide range of sizes and in both globe and angle patterns. The quarter-inch size, designed for instrumentation, is only 2¾ inches high — 1½ inches wide. Larger sizes, where bulk is not a problem, are comparable to conventional needle valves. In the globe design, you can take your choice of famous Stemalloy® bronze stems or cadmium-plated steel stems. All patterns have new gland followers and fine thread-pitch for close regulation.

FOR MORE INFORMATION, request Circular 568. Your Lunkenheimer Distributor has it, or you can write for a copy to The Lunkenheimer Company, Box 360N, Cincinnati 14, Ohio.

*Patented Alloy

LUNKENHEIMER
THE ONE *Great* NAME IN VALVES

L-153-23

DUNKIRK
Blue Circle

DUNKIRK

NOW OFFERS YOUR MOST PROFITABLE *1954* STEAM AND HOT WATER HEATING PACKAGE

DUNKIRK
Blue Circle

BOILERS
RADIATION
ACCESSORIES
FOR GAS · OIL · COAL

Dunkirk has the line, the quality, the good looks, the price and the discounts. Dunkirk Blue Circle Boilers are made of cast iron, the lifetime metal. They give you a complete merchandising package for residential and commercial installations. Welcomed by architects, contractors, builders and owners for single or multiple installations and remodeling. Mail coupon and you will learn how it pays to do business with Dunkirk.

DUNKIRK RADIATOR CORPORATION
DUNKIRK, NEW YORK

MAIL THIS COUPON
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DUNKIRK RADIATOR CORPORATION
DUNKIRK, NEW YORK

Send complete details of your 1954 Profit Package.

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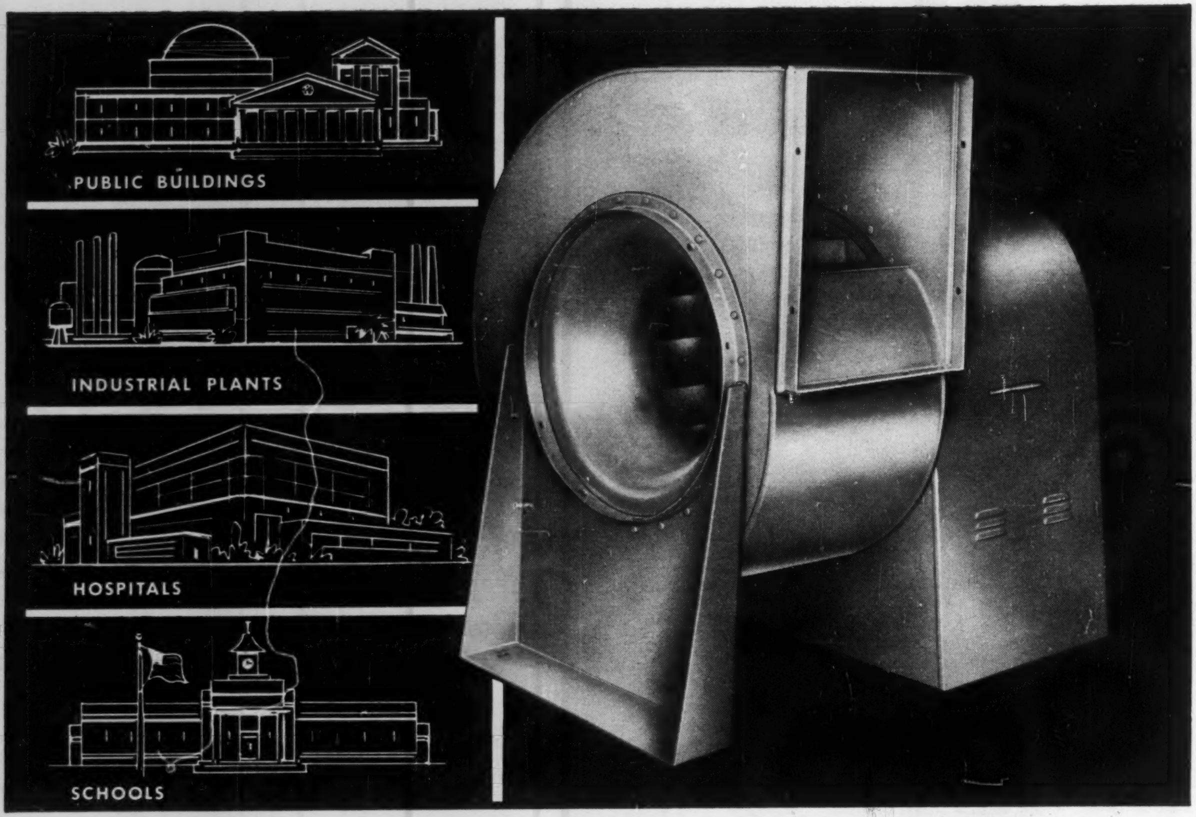
City____________ State________



Quiet, Compact Westinghouse Ventilating Sets are Seven Ways Better!

In industrial plants, schools, hospitals, public buildings—wherever quiet, low-cost, reliable ventilation of small to medium areas is required, check the features of Westinghouse Ventilating Sets before you specify. Only Westinghouse offers all seven of these benefits:

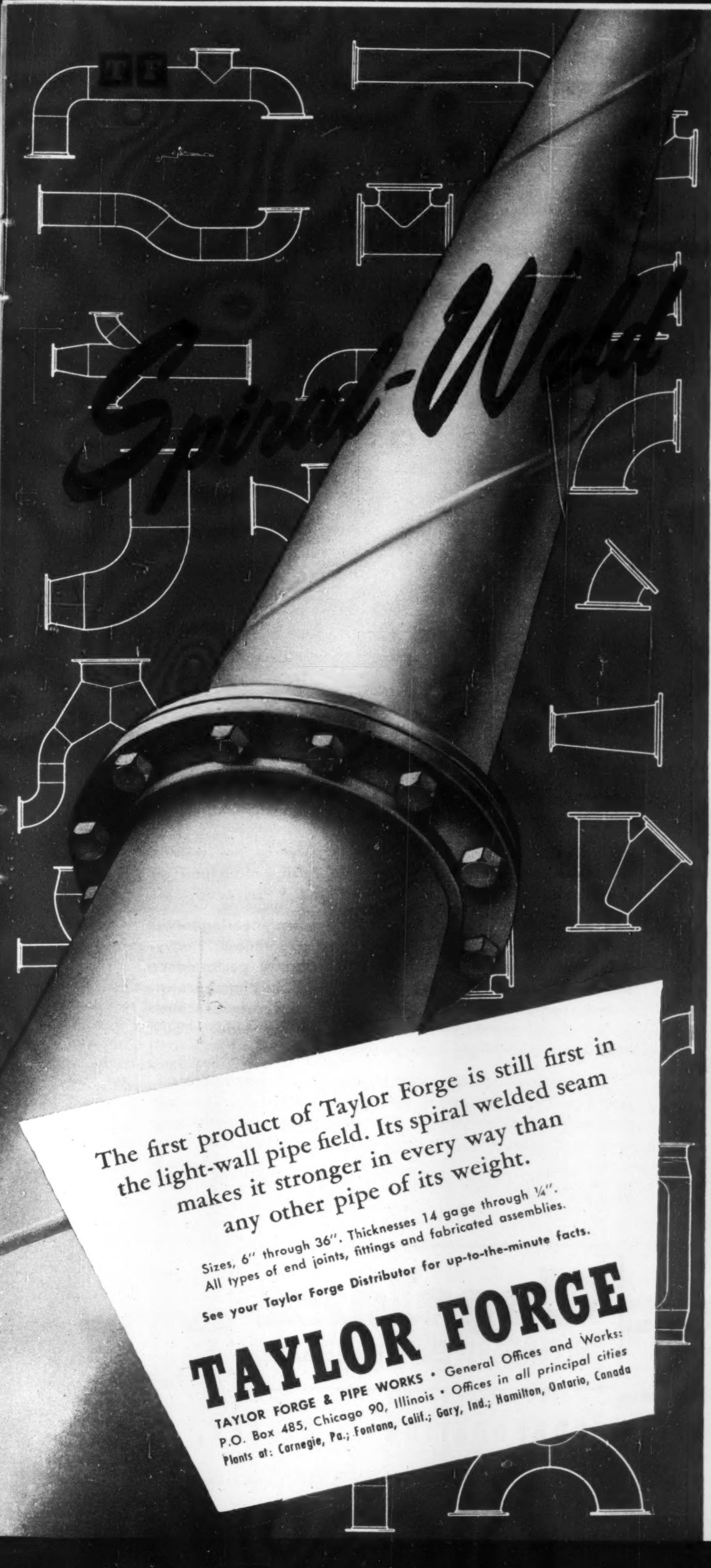
1. *Low power consumption*, thanks to wheel designs that combine top efficiency with large capacity
2. *Simple installation* because these compact fan-motor units are miserly with space, easy to set up
3. *Extra-quiet operation* because carefully designed inlets give smooth, steady airflow
4. *Convertible air discharge*—as you want it, when you want it, even after initial installation
5. *Weatherproof covers* that keep these units dry and clean when mounted outdoors
6. *Trouble-free operation* that cuts maintenance, permits installation in out-of-the-way locations
7. *Exclusive warranty* that only Westinghouse-Sturtevant can offer because of undivided equipment responsibility

Westinghouse Ventilating Sets are available now either direct-connected for volumes from 150 to 3200 cfm, or v-belt driven (illustrated above) for volumes from 375 to 14,400 cfm. Wheel diameters range from 6 to 30 inches. Ask your Westinghouse-Sturtevant representative for further details. Get catalog 1160. Write: Westinghouse Electric Corp., Sturtevant Division, Hyde Park, Boston 36, Mass.

WESTINGHOUSE AIR HANDLING

YOU CAN BE **SURE** ... IF IT'S **Westinghouse**

J-80409



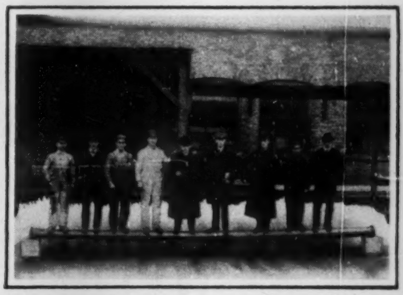
The first product of Taylor Forge is still first in the light-wall pipe field. Its spiral welded seam makes it stronger in every way than any other pipe of its weight.

Sizes, 6″ through 36″. Thicknesses 14 gage through ¼″. All types of end joints, fittings and fabricated assemblies.

See your Taylor Forge Distributor for up-to-the-minute facts.

TAYLOR FORGE

TAYLOR FORGE & PIPE WORKS • General Offices and Works:
P.O. Box 485, Chicago 90, Illinois • Offices in all principal cities
Plants at: Carnegie, Pa.; Fontana, Calif.; Gary, Ind.; Hamilton, Ontario, Canada



Taken in 1905 . . .

This faded photo was snapped five years after Taylor Forge started back in 1900. That line-up of old timers were putting on a convincing demonstration of the first Taylor Forge product—"Taylor's Spiral Riveted Pipe."

The clothing and hat styles may be dated, but not the pipe. Taylor Spiral Pipe (now welded instead of riveted) then was, and still is, the strongest pipe of its weight.

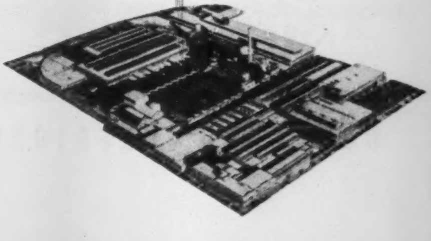
But while the pipe itself proved revolutionary, the only flanges then available for it—cast iron flanges—were not up to the standard of the pipe. The iron flanges often cracked and caused trouble…and since Taylor Forge couldn't *get* better Flanges, Taylor Forge decided to *make* better flanges.

So in that long-ago Taylor Forge set up facilities for making forged steel flanges. It was a pioneering step …the first time forged steel flanges had been made on a commercial scale. It was also a turning point…for it marked the transition from simply making pipe into the field of *designed* piping.

**An episode in the story of
Taylor Forge leadership in designed piping**

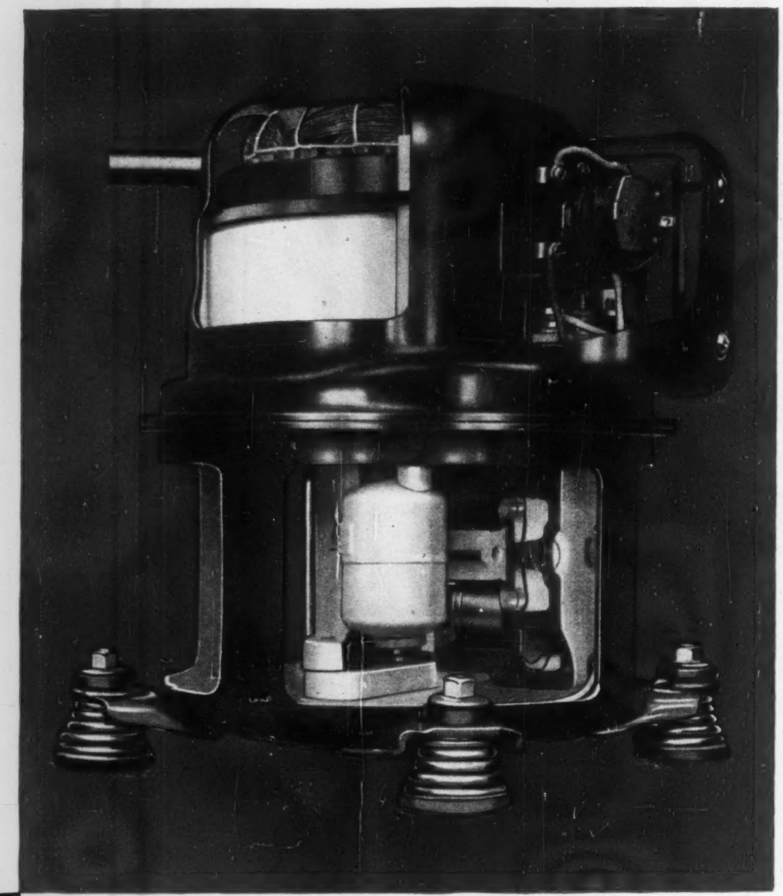
We started here in 1900.

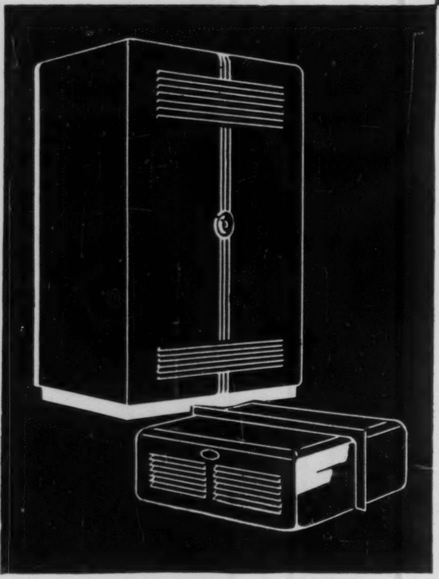
One of the five Taylor Forge plants of today is shown below.



COPELAND WELDED HERMETICS

bring cool-running, 2-cylinder smoothness to package air conditioning



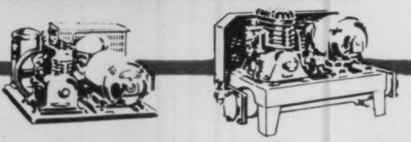


You're looking at a cutaway view of the welded motor-compressor that can give your refrigeration and air conditioning products the competitive edge you need.

This potent Copeland package is engineering at its best. Twin cylinders bring whisper-quiet smoothness. Heavy-duty, high power factor motor insures positive performance and long-range economy. Use of F-12 in these motor-compressors can result in as much as 75 F. lower temperatures in windings, crankcase, oil and discharge side. You'll appreciate their high capacities.

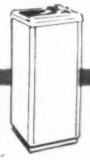
We could go on, point by point, and prove construction superiority. Better yet, we want you to test the Copeland welded motor-compressor in your own equipment under your own conditions.

Write, wire or phone for details about the "try it yourself" test.



Copeland

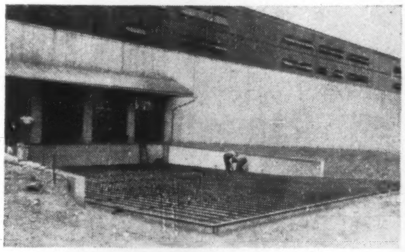
DEPENDABLE *Electric* REFRIGERATION



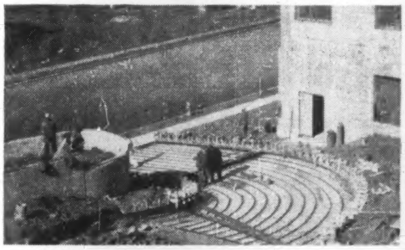
REFRIGERATION UNITS (OPEN - TYPE AND COPELAMETIC) WATER COOLERS

COPELAND REFRIGERATION CORPORATION SIDNEY, OHIO

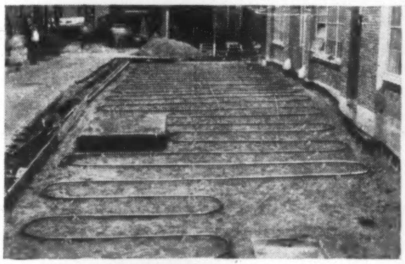
No more shipping ~~slow~~snowdowns!



Trucks and trailers will never get stuck in this dock approach.



All-weather access assured by snow melting at warehouse ramp.



Snow will never block the truck approach to this mill.

EXPRESS LINES INC.
NEW YORK • BOSTON • PITTSBURGH • CHICAGO

Snow Melting helps industry move what it makes!

Transportation slowdowns, caused by snow or ice at loading and receiving docks, in road or driveway approaches, on private tracks and spurs, are costly penalties to pay when modern snow melting systems are available.

The constant, uninterrupted flow of both raw materials and finished products *in* and *out* of plants, warehouses and other business buildings is as vital to the nation's commerce as production and manufacturing itself!

So, where hazardous weather may be expected even occasionally, steel pipe snow melting systems provide practical insurance . . . while in areas where snow and ice may be every-winter plagues, snow melting stops delay at the approaches dead-in-its-tracks!

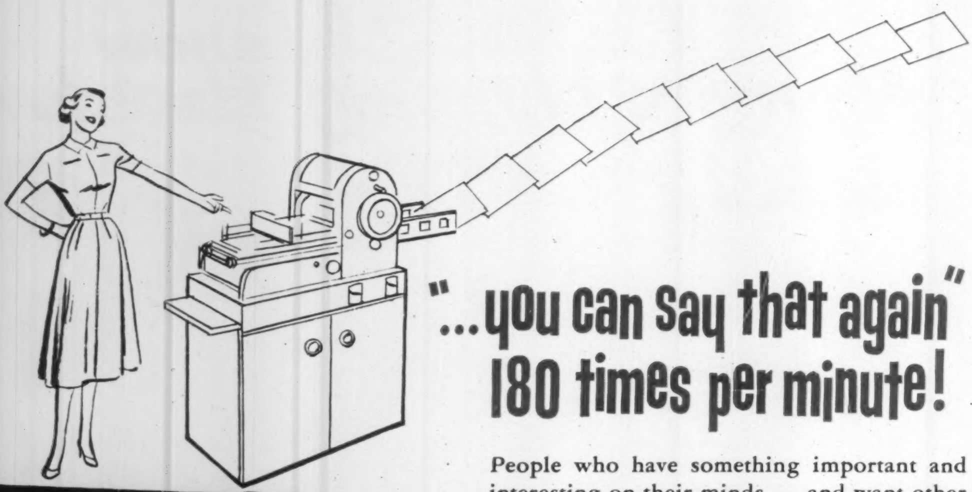
You would expect, and rightly so, that steel pipe is the favored heat transmission medium for these industrial and commercial snow melting installations. For steel pipe has been the faithful stand-by of industry for more than 60 years . . . for plumbing, heating, fire sprinkler systems, power, steam and air transmission, and a host of mechanical uses. Once again industry turns to this economical and durable product for the panels, coils and runs of its snow melting installations.

Yes, for snow melting, *steel pipe is first choice,* the most widely used pipe in the world!

Send for new, free 32 page color booklet "Steel Pipe Snow Melting and Ice Removal Systems".

Steel Pipe
is First Choice

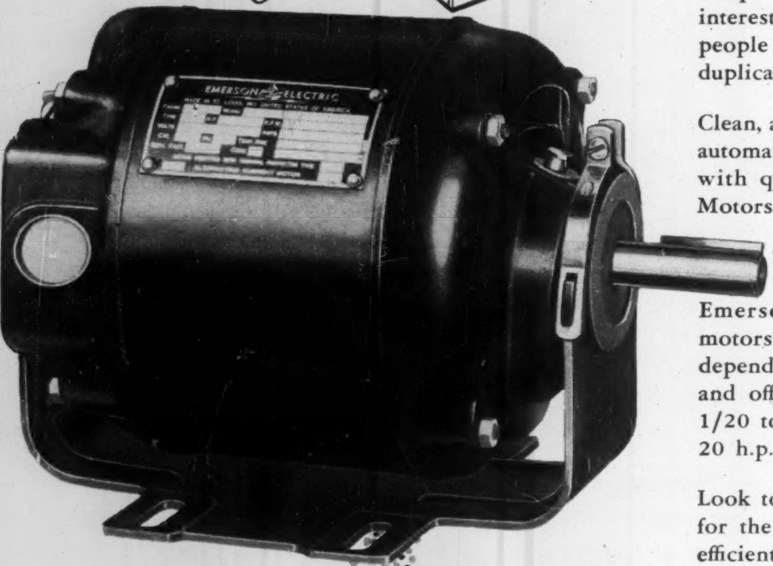
COMMITTEE ON STEEL PIPE RESEARCH
AMERICAN IRON AND STEEL INSTITUTE
350 Fifth Avenue, New York 1, N.Y.



"...you can say that again" 180 times per minute!

People who have something important and interesting on their minds . . . and want other people to know about it . . . rely on modern duplicating equipment.

Clean, accurate copies—180 per minute—flow automatically from these machines, powered with quiet, dependable Emerson-Electric Motors.



Emerson-Electric specializes in building motors for equipment with a reputation for dependability. It has done so for 64 years, and offers standard motors in ratings from 1/20 to 5 h.p., and hermetic motors 1/8 to 20 h.p.

Look to Emerson-Electric if you are looking for the right motor to power your product efficiently, dependably. Your inquiry is invited.

THE EMERSON ELECTRIC MFG. CO.

St. Louis 21, Mo.

Write for these Emerson-Electric Motor Data Bulletins

Manufacturers requiring motors 1/20 to 5 h.p. can profitably use these reference guides. Specifications, construction and performance data are included for these motors:

☐ M410-A Capacitor-Start
☐ M410-B Split-Phase
☐ M410-C Integral
☐ M410-D Fan-Duty
☐ M410-E Oil-Burner
☐ M410-F Jet Pump
☐ M410-G Blower

EMERSON ELECTRIC
MOTORS • FANS APPLIANCES

Put WASTE HEAT to WORK!

Servel changes a dead loss into valuable PROCESS COOLING *and* AIR CONDITIONING

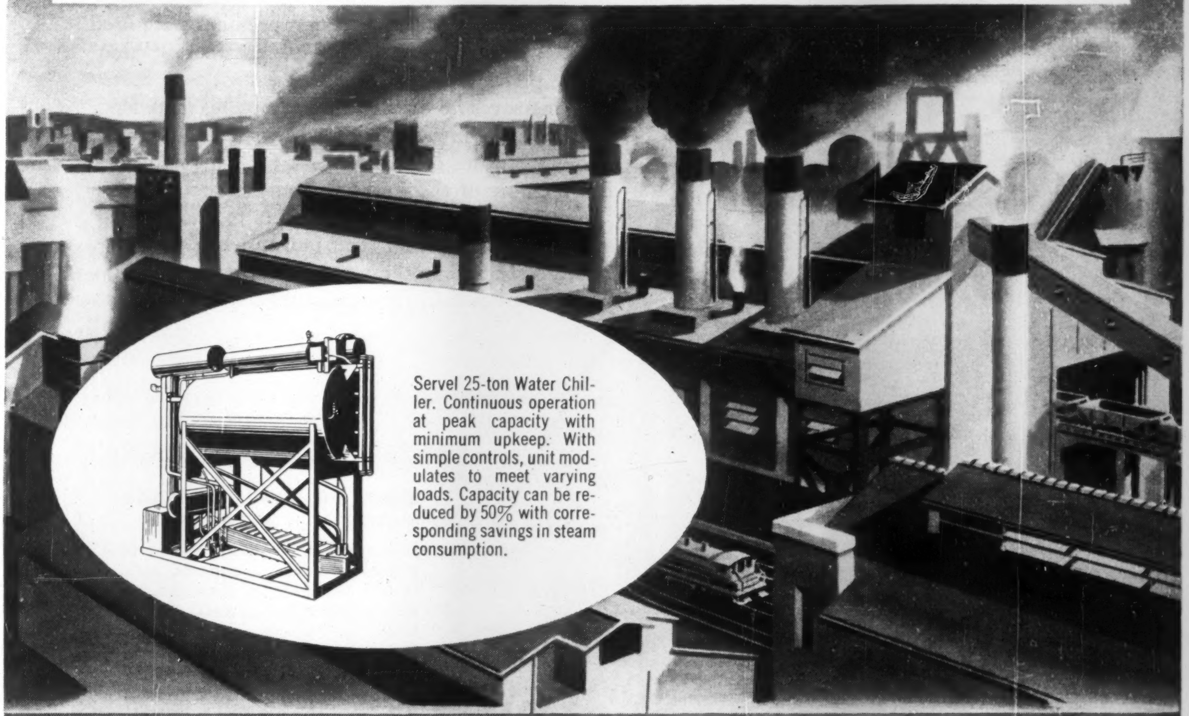
● If there's a need in your plant for air conditioning, process cooling, or industrial precooling, there's most certainly a place for a Servel Water Chiller.

These highly efficient units are powered by steam from any source. Many plants have found that *waste heat is readily turned to this use.*

Consider, too, the advantages beyond the availability and low cost of energy. Servel Water Chillers employ the time-proved absorption principle of refrigeration that *eliminates moving parts.* Water is used as the refrigerant. No compressors!

Compact size, quiet, vibration-free operation, and low floor loading make possible single or multiple installations in practically any location. Simple and economical piping arrangements are possible. In many air-conditioning installations for large buildings, duct systems can be eliminated entirely.

Servel Water Chillers are available in capacities for many types of *load. All carry a full 5-year warranty!* Contact your Servel dealer, or mail coupon for details and engineering help on your problems.



Servel 25-ton Water Chiller. Continuous operation at peak capacity with minimum upkeep. With simple controls, unit modulates to meet varying loads. Capacity can be reduced by 50% with corresponding savings in steam consumption.

Servel

the name to watch for great advances in

AIR CONDITIONING ✓ REFRIGERATION

SEND NOW FOR DETAILS!

SERVEL, INC., Dept. HP-6, Evansville 20, Indiana

Send me further details on Servel equipment for air conditioning, process cooling and industrial precooling.

Name____

Firm____

Address______________________________________

City________________________Zone_____State_______________

"I shot an arrow into the air,
It fell to earth, I know not where."

The Arrow and the Song—Longfellow, 1845

Longfellow a space buyer?

Longfellow's lament could well have been applied to advertising back in 1845. Yes, even up to 1914 when a group of advertisers, agencies and publishers, alarmed by the waste and guesswork in their business, brought order out of advertising chaos by organizing the Audit Bureau of Circulations. These pioneers in circulation auditing established a definition for paid circulation, rules and standards for measuring circulation, methods for auditing and reporting the FACTS. *For value-minded advertisers the era of blind space buying ended in 1914.* ☆ ☆ Today's experienced space buyers use the audited information in A.B.C. reports to aid them in applying media to markets and get full value for advertising dollars. Here are some of the FACTS in A.B.C. reports that provide a sound basis for advertising investments: • How much paid circulation • How much unpaid distribution • Occupational or business breakdown of subscribers • Where they are located • How much subscribers pay • Whether or not premiums are used • How many subscribers in arrears • What percentage of subscribers renew. ☆ ☆ Sales messages go direct to their targets, there's no shooting "into the air" when space buyers base their decisions on A.B.C. FACTS. This publication is a member of the Audit Bureau of Circulations because we want our advertisers to know what they get for their money when they use space in these pages. Ask for a copy of our A.B.C. report and then study it.

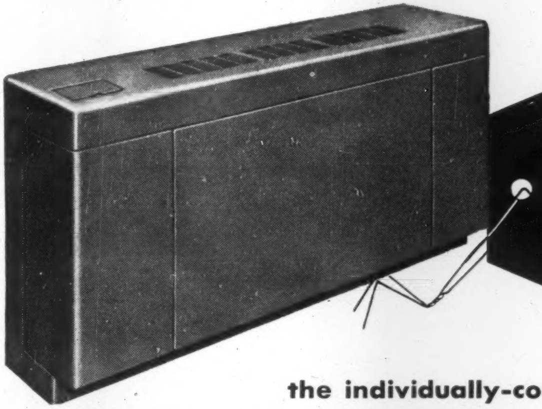
AUDITED PAID CIRCULATION
ABC
ABC Report

SEND THE RIGHT MESSAGE TO THE RIGHT PEOPLE

Paid subscriptions and renewals, as defined by A.B.C. standards, indicate an audience that has responded to a publication's editorial appeal. With the interests of readers thus identified, it becomes possible to reach specialized groups effectively with specialized advertising appeals.

A.B.C. REPORTS—FACTS AS A BASIC MEASURE OF ADVERTISING VALUE

Check the reasons why the popular choice for summer cooling and winter heating is



The REMOTAIRE by AMERICAN-Standard

the individually-controlled unit that filters and circulates the air all year 'round in central-plant, multi-room installations

. . . .

Architects, builders and heating contractors like the Remotaire because it's versatile, easy and economical to install, space saving.

Building owners like the Remotaire because it provides healthful, draft-free comfort conditioning all year 'round with minimum attention.

- ✓ Same simple piping circuit supplies chilled water for summer cooling, hot water for winter heating. No unwieldy ductwork needed.

- ✓ The Remotaire is adaptable to the best system for the job—Wall Aperture System, Interior Ventilation System, Well Water System, Split-coil System, Motel System, Residential System, Modernization System.
- ✓ Units can be installed recessed, partially recessed or free-standing.
- ✓ Three popular sizes to choose from—200, 400, 600 cfm. A size for every job.
- ✓ Easy to service. Every part of the assembly can be reached easily, quickly.
- ✓ Easy to maintain. Motor assembly can be taken out and replaced in less than 15 minutes.
- ✓ Reversible coil is designed for right or left hand connection. Easily reversed in the field.
- ✓ Special electrical junction box is easy to get to.
- ✓ Sturdily built . . . doesn't have to be pampered in installation. (Reinforced grille will support weight of 200 lb. man!)

- ✓ Each unit is individually controlled . . . temperature in each room can be changed without affecting adjoining space.
- ✓ The Remotaire is quiet. No whistling-jet noises.
- ✓ Handsome jacket, furnished in semi-gloss Cooltan, can be painted any color.
- ✓ Toe-step offset permits better fitting of rugs around units and eliminates marring of front when cleaning floors.
- ✓ Drain pan protection. Large pan runs entire length of unit to prevent condensation drip. Grille shield prevents foreign matter from entering through top.
- ✓ Large filters . . . keep air fresh and clean.
- ✓ Adjustable damper. Amount of air intake can be changed at any time.
- ✓ Wall seal. Rubber molding around back panel provides air seal between unit and uneven plaster.

For further information on the Remotaire see Sweet's Architectural File or contact your nearest American-Standard sales office for descriptive literature.

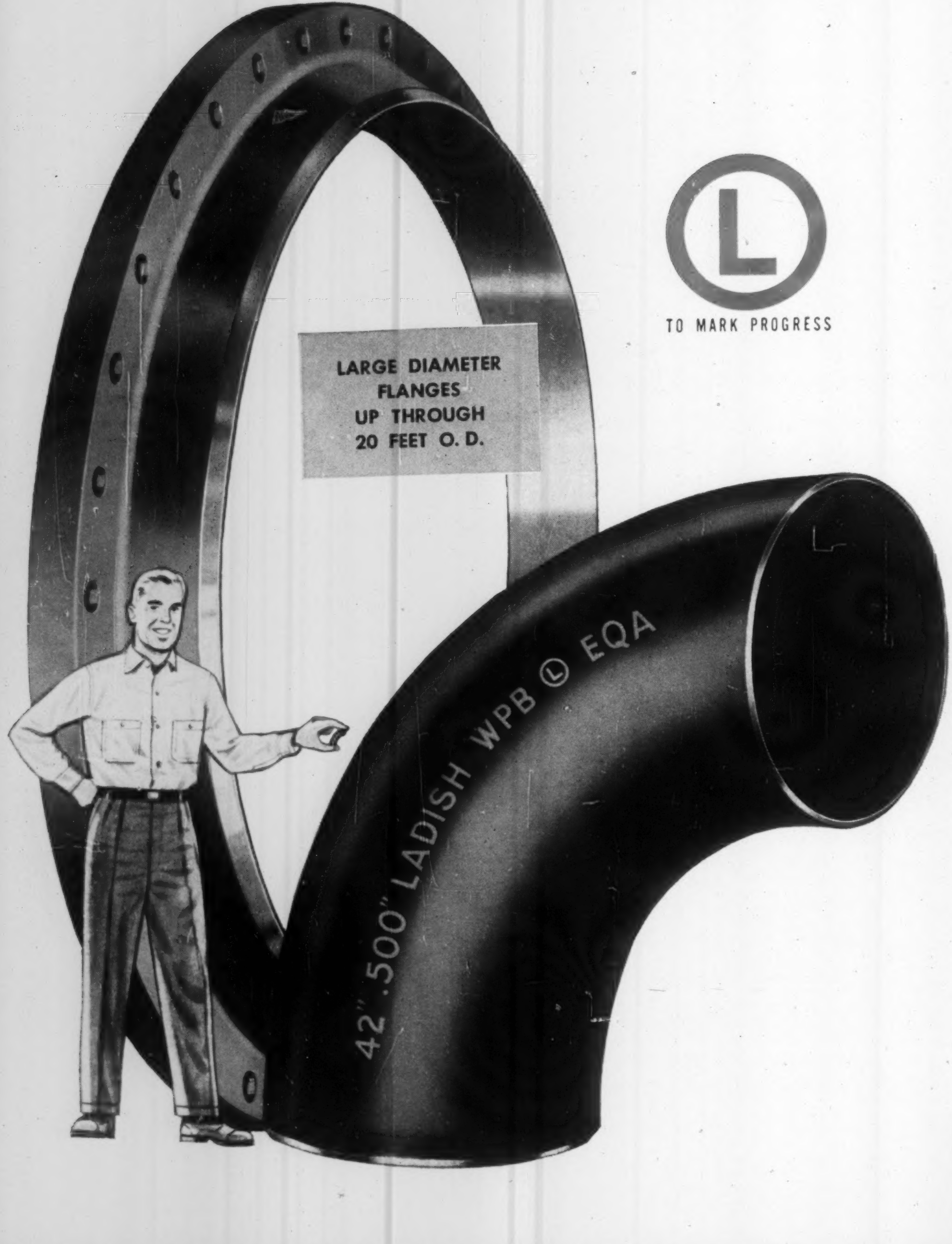
AMERICAN-Standard
HEATING-COOLING SYSTEMS

American Radiator & Standard Sanitary Corporation, P. O. Box 1226, Pittsburgh 30, Pa.

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

Depend on LADISH

To Meet All Your Fittings Needs With an Unsurpassed Range of Sizes and Materials


LARGE DIAMETER FLANGES UP THROUGH 20 FEET O. D.
42" .500" LADISH WPB Ⓛ EQA

Ⓛ

TO MARK PROGRESS

1 **BUTT WELDING FITTINGS**

2 **A.S.A. FORGED FLANGES**

3 **FORGED SCREWED OR SOCKET WELDING FITTINGS**

4 **T.E.M.A. HUB & RING FLANGES**

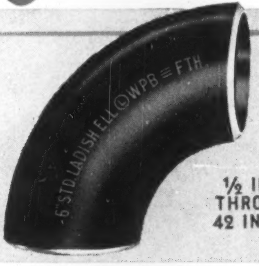
5 **LONG WELDING NECKS**

6 **LARGE DIAMETER FLANGES AND RINGS**

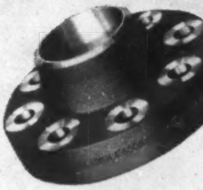
Available in...

Complete Service . . .

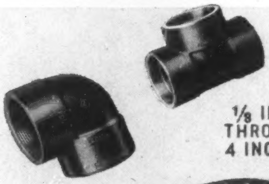
To Meet Your Entire Fittings Needs with a Line Complete In All 6 Major Types



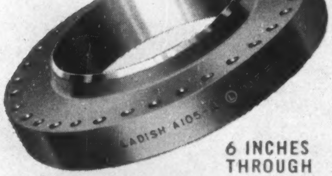
½ INCH
THROUGH
42 INCHES



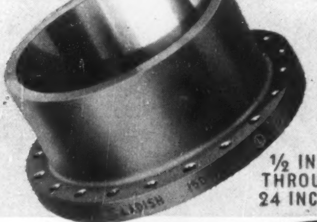
½ INCH
THROUGH
24 INCHES



⅛ INCH
THROUGH
4 INCHES



6 INCHES
THROUGH
46 INCHES



½ INCH
THROUGH
24 INCHES

UP THROUGH
20 FEET O.D.

CARBON, STAINLESS AND ALLOY STEELS, ALUMINUM, NICKEL AND OTHER FERROUS AND NON-FERROUS METALS

For dependable service that results from an ideal combination of broad line and ample stock . . . specify and buy LADISH . . . the Controlled Quality line that offers a complete range of sizes, types, weights, pressure ratings and materials needed for virtually any piping installation. Your local Ladish distributor's ample stock is backed by complete factory inventories to keep your piping jobs on schedule. So, for *complete service* in fittings . . . specify and buy LADISH.

LADISH
FITTINGS

For your new 304-page Ladish Fittings Catalog, No. 55 contact your Authorized Ladish Distributor, your local Ladish District Office, or write to Ladish Co., Dept. HPAC, Cudahy, Wis.

THE COMPLETE *Controlled Quality* FITTINGS LINE
PRODUCED TO ONE STANDARD OF UNSURPASSED QUALITY

LADISH CO.

CUDAHY, WISCONSIN
MILWAUKEE SUBURB

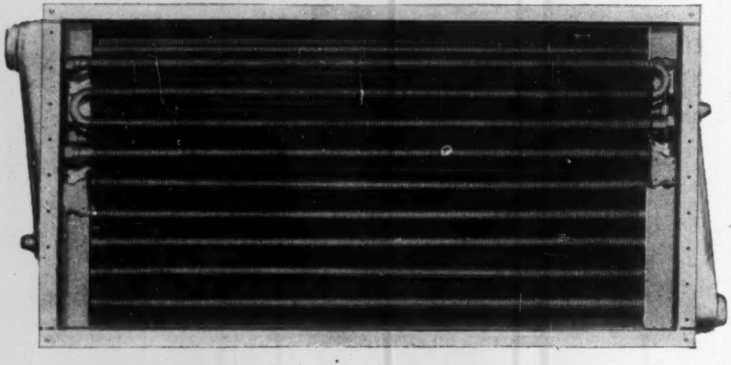
District Offices: New York • Buffalo • Pittsburgh • Philadelphia • Cleveland • Chicago • St. Paul
St. Louis • Atlanta • Houston • Tulsa • Los Angeles • San Francisco • Havana • Mexico City • Brantford, Ont.

We Make

Extended-Surface

HEAT EXCHANGERS

Exclusively!



The pioneer in the field, Aerofin has concentrated on one thing, *and one thing only* — highly efficient, easily installed, easily maintained extended-surface heat exchangers. Aerofin's design, research, engineering and production experience and facilities are unequalled anywhere.

For High Efficiency, Easy Installation, Low Maintenance and Servicing Costs . . .

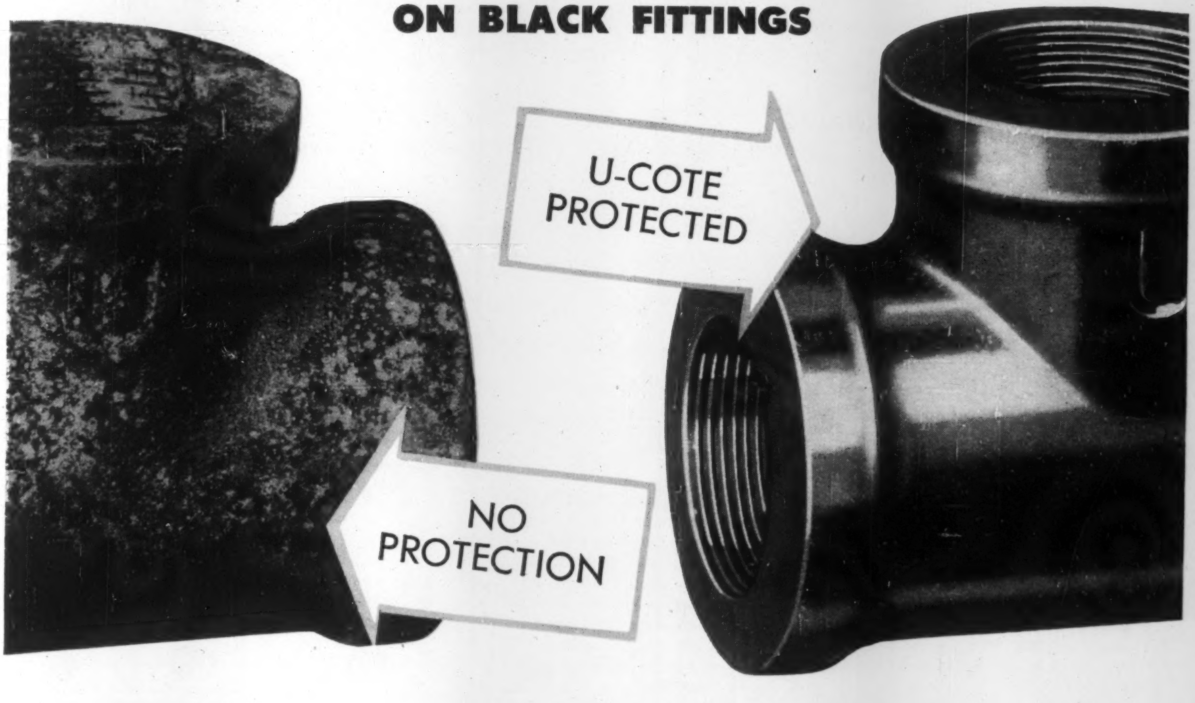
Aerofin is sold only by manufacturers of fan system apparatus. List on request.

AEROFIN CORPORATION

410 South Geddes St.
SYRACUSE, N. Y.

NO EXTRA COST FOR U-COTE PROTECTION!

ON BLACK FITTINGS



U-Coted fittings resist rust and corrosion and only Union Malleable can offer this exclusive protective coating. Actual laboratory tests have proved that U-Coted fittings protect against fumes, acids, alkalies, steam, water, soot, smoke, soap, rust, electrolysis, abrasion, wear, sun, heat, oxidization, corrosion Ask for U-brand fittings and remember—you get the extra advantages of U-Cote at no additional cost.

A Complete Line of Galvanized and Black Malleable, Copper, Sweat and Cast Iron Drainage Fittings, Nipples and Unions Distributed Through Wholesalers All Over the World

The UNION MALLEABLE MANUFACTURING CO.
ASHLAND, OHIO, U.S.A.

the best running mate *your* product can have–

DELCO MOTORS

Every Delco motor, large or small, is engineered and built to assure the uninterrupted usefulness of the product it ultimately will serve. In the wide range of Delco fractional and integral motors, you can be sure that you will find the best running mate *your* product can have.

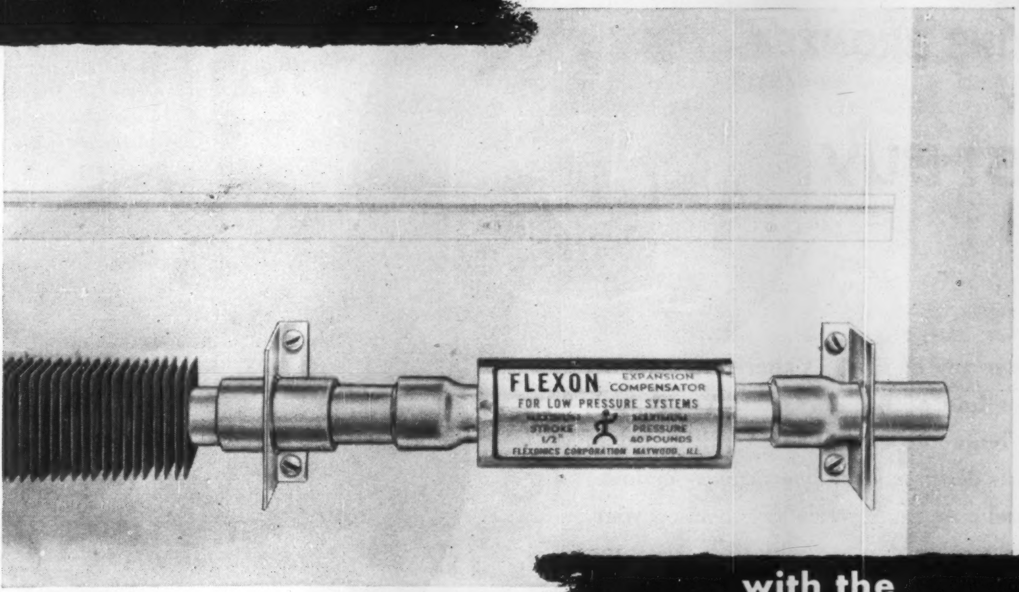
DELCO PRODUCTS

DIVISION OF
GENERAL MOTORS CORPORATION
DAYTON 1, OHIO

SALES OFFICES:
Atlanta • Chicago • Cincinnati
Cleveland • Dallas • Detroit • Hartford
Philadelphia • St. Louis • San Francisco

STOP

expansion leakage and pipe creeping noises in steam and hot water heating systems


FLEXON EXPANSION COMPENSATOR
FOR LOW PRESSURE SYSTEMS
MAXIMUM STROKE 1/2"
MAXIMUM PRESSURE 40 POUNDS
FLEXONICS CORPORATION MAYWOOD, ILL.

with the *NEW* FLEXON EXPANSION COMPENSATOR

DESIGN DETAILS

EXPANSION COMPENSATOR
PRESSURE SYSTEMS
MAXIMUM STROKE
MAXIMUM PRESSURE
FLEXONICS CORPORATION, Maywood, Ill.

The Flexon Expansion Compensator consists of a two ply phosphor bronze bellows with copper tube end connections (sizes 3/4" to 1 1/4") enclosed in a floating protective shroud of brass. All joints are electronically sealed with silver solder for long leak-proof life. The 2" size has standard threaded fittings. Threaded fittings for other sizes are also available. A single compensator will handle total piping motion up to 5/8" (1/2" in compression, 1/8" in extension). Suitable for temperatures from —60° F. to 250° F. and for pressures up to 40 psig.

Now, for the first time, there is a practical, economical answer to the problem of expansion control in low pressure steam and hot water heating systems—the new FLEXON Expansion Compensator. It is especially designed and manufactured for finned type convectors, baseboard, radiator or heating supply lines. The FLEXON Expansion Compensator absorbs thermal expansion and puts an end to the danger of leakage that often results from the stresses set up by uncontrolled expansion. At the same time it eliminates the pipe creeping noises that frequently accompany expansion. Important, too, is the fact that FLEXON Expansion Compensators are made to outlast the building in which they are installed. There is no maintenance . . . just put them in and forget them.

FLEXON Expansion Compensators are made in 3/4", 1", 1 1/4" and 2" sizes. Contact your local distributor for further information, or use the coupon below to get the descriptive bulletin.

Flexonics *Corporation*

Flexon identifies products of Flexonics Corporation that have served industry for over 52 years.

EXPANSION JOINT DIVISION
1391 S. Third Avenue
Maywood, Illinois

Flexonics Corporation
1391 S. Third Ave.
Maywood, Ill.

Please send me the bulletin which describes and gives full specifications for the Flexon Expansion Compensator.

Name ....

Company ....

Address ....

City........................ *Zone*.... *State*............

My Wholesaler is:..

Built-in $AVING$ make JENKINS BRONZE GATES your BEST BUY

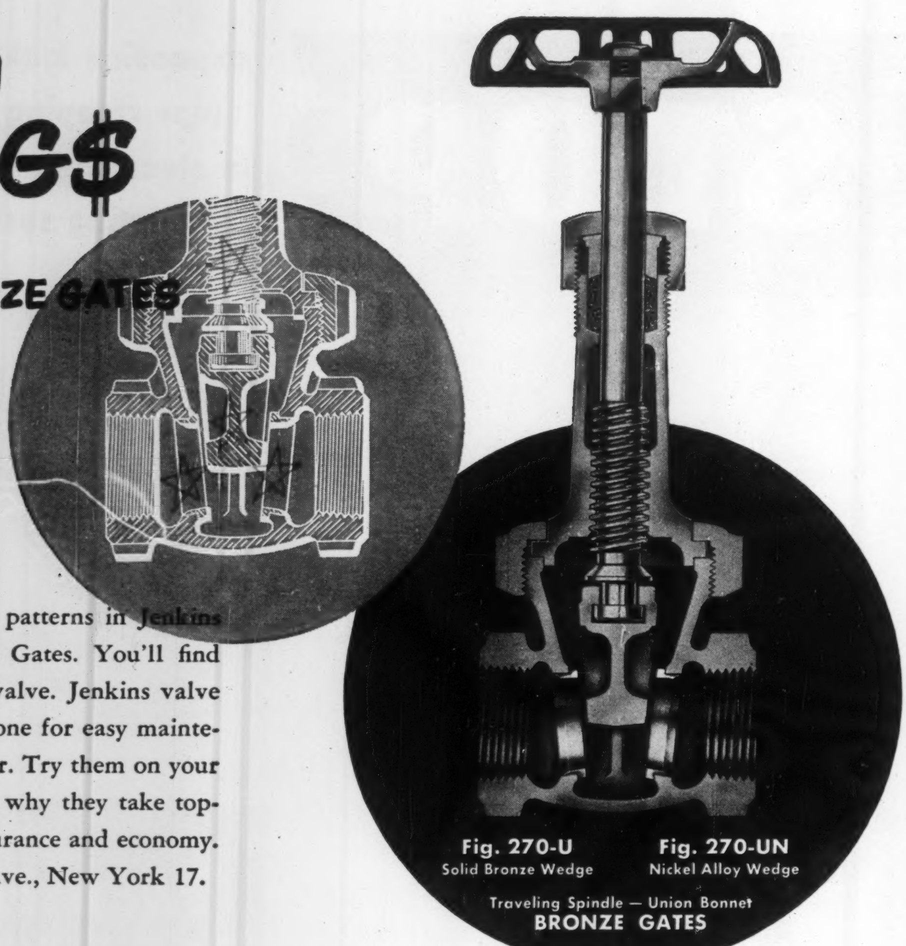
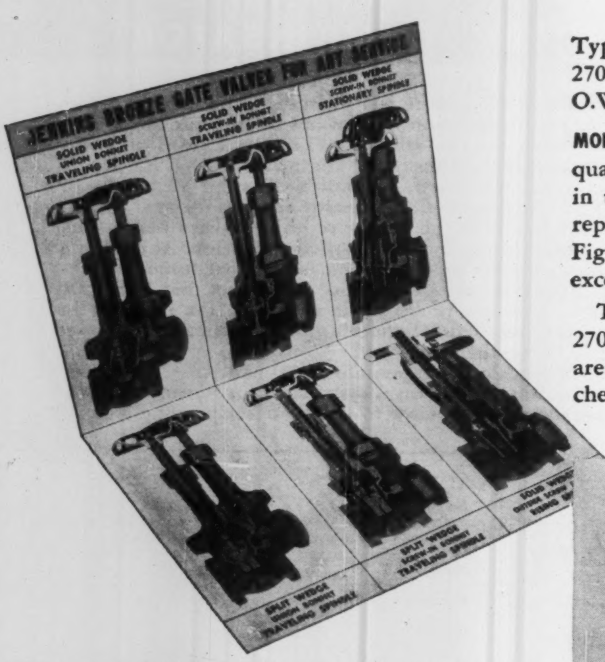


Fig. 270-U
Solid Bronze Wedge

Fig. 270-UN
Nickel Alloy Wedge

Traveling Spindle — Union Bonnet
BRONZE GATES

Look over any of the 35 patterns in Jenkins complete line of Bronze Gates. You'll find *savings* built into every valve. Jenkins valve specialists designed each one for easy maintenance and extra long wear. Try them on your toughest services and see why they take top-rating in any test for endurance and economy. Jenkins Bros., 100 Park Ave., New York 17.


JENKINS BRONZE GATE VALVES FOR ANY SERVICE
SOLID WEDGE UNION BONNET TRAVELING SPINDLE
SOLID WEDGE SCREW-IN BONNET TRAVELING SPINDLE
SOLID WEDGE SCREW-IN BONNET STATIONARY SPINDLE
SPLIT WEDGE UNION BONNET TRAVELING SPINDLE
SPLIT WEDGE SCREW-IN BONNET TRAVELING SPINDLE
SOLID WEDGE OUTSIDE SCREW RISING SPINDLE

Jenkins Bronze Gate folder shows the many types available — lists convincing reasons why they are your best buy for any service. Ask for Form 181-A.

Typical of Jenkins design for built-in savings are the Fig. 270-U and Fig. 270-UN Gates for 200 lb. Steam, 400 lb. O.W.G. services.

MONEL AND BRONZE SEATING COMBINATION In Fig. 270-U a high quality bronze wedge seats against MONEL rings expanded in the body. The wedge takes the wear — it can easily be replaced when necessary by slipping a new one on the stem. Fig. 270-UN, with a nickel alloy wedge, is recommended for exceptionally severe conditions of rapid wear and corrosion.

These and other features of rugged construction make Figs. 270-U and 270-UN first choice for economy where conditions are most destructive to valves, as in oil refineries, dye houses, chemical, food, and rubber plants.

JENKINS
LOOK FOR THE DIAMOND MARK
VALVES
SINCE 1864
TRADE JENKINS MARK
Jenkins Bros

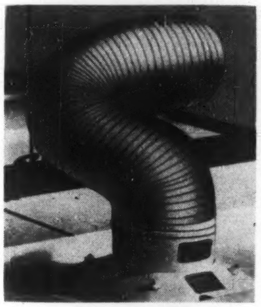
SOLD
THROUGH
LEADING
INDUSTRIAL
DISTRIBUTORS

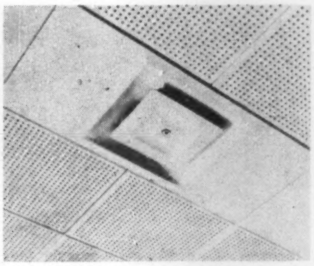
EQUIPMENT DEVELOPMENTS . . .

For reviews of Recent Trade Literature see page 252.

Movable Ceiling Air Diffuser

Air diffuser which fits into a suspension system like acoustical tile . . . . It has a flexible tube duct connection and is interchangeable with both tile and lighting fixtures so that it is removable to any location. The special metal and plastic tubing can be twisted, stretched or compressed and still retain the same interior diameter, thus permitting the diffuser to be offset to the next bay, the manufacturer states. The tubing is also designed so that it will not support combustion or add to the noise level.



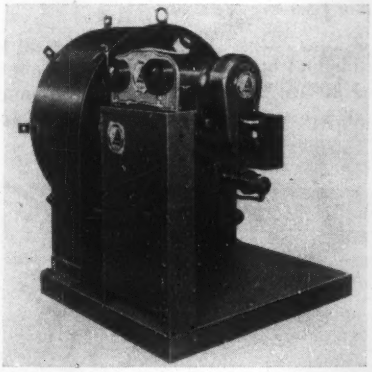


The diffuser itself fits into the tiling. It has a single orifice and self contained sleeve damper. Air volume is controlled by a tool operated from the floor which opens or closes the damper. The unit is made in capacities of 75 to 175 cfm.

Manufacturer—Connor Engineering Corp., Danbury, Conn.

Packaged Combustion System

Packaged combustion system designed to meet the heating and power needs of plants capable of making oil burner or oil and gas burner installations on new or existing boilers with their own maintenance crews. . . . Known as the "Thermopak" plan, it consists of a field surveyed, individually engineered combustion unit



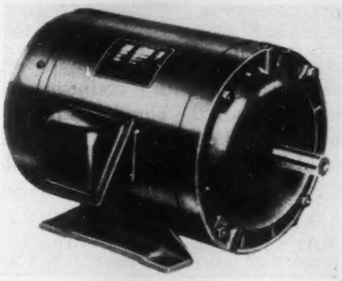
with all controls and accessories, ready for integration with the existing boiler. The unit, according to the manufacturer, will convert any standard fire tube or water tube boiler (from 20 to 525 bhp) to automatic oil fired or combination oil and gas fired operation, using heavy fuel oil requiring preheating.

The "Thermopak" unit consists of a steel platform base, extension front with secondary air damper and refractory front lining, oil burner or oil and gas burner, panel box with all controls and electric, steam or hot water preheaters for the oil.

Manufacturer — Preferred Utilities Mfg. Corp., 1860 Broadway, New York 23.

New Frame Sizes for Motors

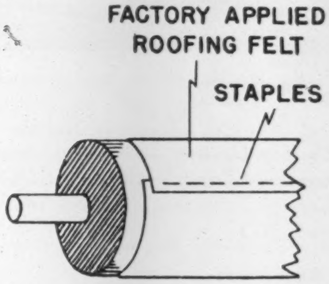
New line of "Series 100" re-rated polyphase a-c motors in the 1 to 30 hp class . . . . The motors are built to new frame size and horsepower standards set by NEMA. According to the company, the motors are smaller and lighter than present models, and in some the horsepower is double that formerly available in frames of the same size. Frames are made of rolled steel and end plates are of cast iron. The copper rotor construction has been retained. The models being offered now are open, drip-proof motors and totally enclosed, fan cooled motors. Both types are available in 182 and 184 frame sizes rated at 1, 1½ and 2 hp at 1800 rpm; 1½, 2 and 3 hp at 3600 rpm; and ¾, 1, 1½ hp at 1200 rpm.



Manufacturer—Howell Electric Motors Co., Howell, Mich.

New Method of Pipe Insulation

New materials and methods for insulating piping . . . . The new process consists of the use of magnesia with factory applied roofing felt. This is clapped on the pipe after which laps are cemented into position with asphalt cement and then stapled. The roof felt is

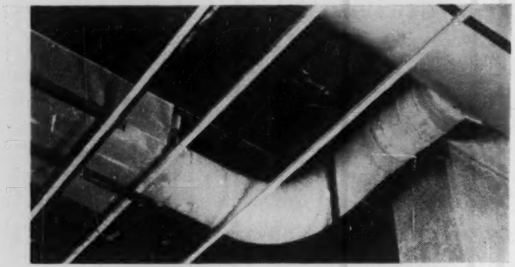


coated with a vinyl resin emulsion paint which prolongs the life of the insulation and prevents cracking, the manufacturer states.

Manufacturer—E. I. du Pont de Nemours & Co., Fabrics & Finishes Dept., Wilmington 98, Del.

Flexible Duct for Air Conditioning

New type of branch ducting for high and low pressure air conditioning systems . . . . Named "Thermaflex A", the manufacturer states that the flexible, lightweight ducting combines low air friction loss with ease of installation. Basic construction of the tubing is a continuous galvanized spring steel helix covered with a bonded three-ply laminate of fiber glass sandwiched between two layers of aluminum sheeting. The aluminum is bonded to the fiber glass with a resinous elastomeric compound which also binds the aluminum to the wire helix.



The ducting is available in 12 ft lengths and diameters of 2 to 10 in. It is flameproof, will withstand a hydrostatic pressure of 59 lb per sq in. and will function within a temperature range of 0 to 250 F, the manufacturer states.

Manufacturer—Flexible Tubing Corp., Guilford, Conn.

Color Coded Copper Water Tube

New method for identification of the various sizes of copper water tube. . . . "Scotch" brand pressure-sensitive labels are affixed to each 20 ft straight length of tube. "Type K" has a red label, "Type L", blue and "Type M", yellow. The size and type of the tube is printed on each label. The labels are placed parallel with the length and at least 6 in. from the end of each tube so that they will not interfere with the installation of fittings. The tube is also permanently marked in the regular way, showing trademark and type.

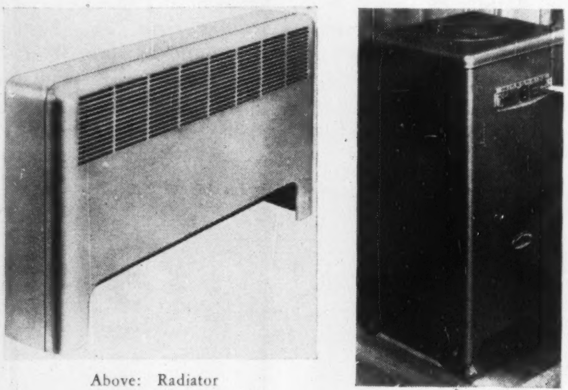
3/4" TYPE K
3/4" TYPE L
3/4" TYPE M

Manufacturer — Triangle Conduit & Cable Co., Inc., Brass and Copper Tube Div., Triangle and Jersey Aves., New Brunswick, N. J.

Convector Radiators

Convector radiators added to line of heating and ventilating products . . . . The lightweight heating elements are seamless copper tubes mechanically expanded into aluminum fins. Tubes are joined to copper headers with a high temperature solder for maximum heat transfer efficiency. The radiators are available with tappings for two-pipe steam, two-pipe hot water and one-pipe steam heating systems. The cabinets are designed for both free standing and semi-recessed installation. The cabinet panels are removable and damper fronts are available.

Manufacturer—American Air Filter Co., Inc., Herman Nelson Products, 215 Central Ave., Louisville 8, Ky.



Above: Radiator
Right: Air Cleaner

Room-Size Electrostatic Precipitator

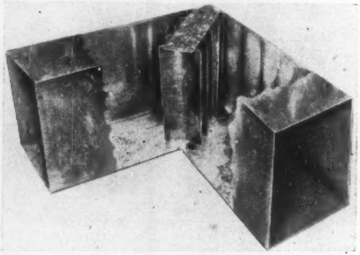
"Micronaire" electrostatic air cleaner designed to screen out microscopic particles from room air, aiding those who suffer from hay fever, asthma and allergies . . . . According to the company, it strains out smoke, pollen, dust, lint and many types of germs. The cleaner uses about the same amount of current as a 40 watt light bulb. Air is drawn into it by a motor-driven fan and passed over a series of closely spaced metal plates. Every other plate is electrically charged and acts as a magnet. The unit containing these plates can be removed in one piece and washed.

The air cleaner weighs 60 lb, is 30 in. high and 15 in. wide and deep. It is mounted on casters to facilitate moving from room to room. No installation is required other than plugging it into a wall outlet.

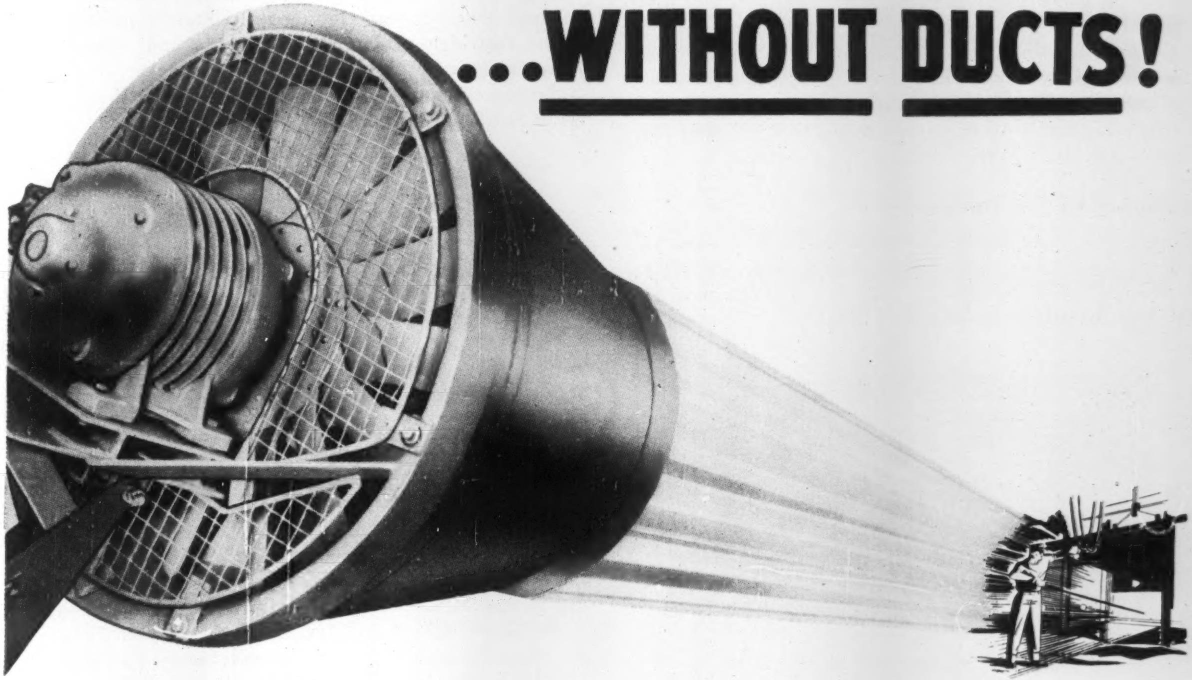
Manufacturer—Raytheon Mfg. Co., Waltham 54, Mass.

Rail for Air Turning Vanes

"Duro Vane Rail" designed to provide a simplified method of making air turning vanes for square or "change of size" elbows. . . . The vanes, cut from scrap metal, are rolled to form an approximate quarter-circle arc. Each vane is positioned in the depressed slot in the rail. The slot forces the vane to form the proper



SHOOT COOLING AIR 60 FEET
...WITHOUT DUCTS!



"HY-V" AIR JETS project a stream of cooling air to plant hot spots at velocities up to 5780 FPM. The "Hy-V" is a 14-blade axial flow pressure fan built into a nozzle-shaped housing. This fan eliminates expensive ductwork and it's flexible too — it can be aimed up, down or from side to side. And since "Hy-V" hurls the air stream as far as 60 feet, it can be mounted in an out-of-the-way location.

COOLS WORKERS The "Hy-V" Air Jet spot-cools men exposed to heat from ovens, furnaces, forges or molten metal. Workmen become less fatigued and require less time out.

COOLS EQUIPMENT "Hy-V" Air Jet directs a concentrated stream of air onto machinery and equipment that must be cooled in a hurry. Quick cooling with "Hy-V" can often speed up production and cut manufacturing costs.

COOLS PRODUCT A high-velocity stream of air can be pin-pointed on a product in process for faster cooling or drying.

These fan units are furnished with wall-mounting brackets or on wheeled stands. Fan wheel diameters range from 18" to 30". Further details are covered in Bulletin DH-8-54. Send for your free copy today.

MAIL COUPON TODAY

DeBothezat Fans

Division of
American Machine and Metals, Inc.
EAST MOLINE, ILLINOIS

DeBOTHEZAT FANS DIVISION
American Machine and Metals, Inc.
Dept. HP-654, East Moline, Illinois
Send free Bulletin DH-8-54 containing complete data on "Hy-V" Air Jets.

FIRM NAME

ADDRESS

CITY ZONE STATE

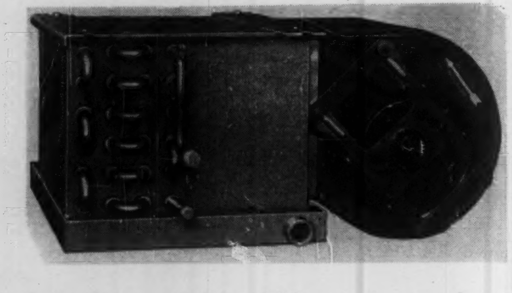
NAME AND TITLE

curve. A chisel blow at designated angles cuts and bends the part of the vane protruding in the slot to form a tight lock known as the "Duro-Lock." After the vanes are inserted into top and bottom rails, the assembly is ready for insertion into the elbow.

Manufacturer — Duro-Dyne Corp., Dept. PR, 800 Third Ave., New Hyde Park, N. Y.

Compact Air Conditioners

"Spotaire 900," an individual room, built in, air conditioner designed for rooms with low ceilings and other space limitations . . . . The new model is 11¾ in. high including an insulated cabinet. It heats, cools, ventilates, filters and dehumidifies to give year 'round air conditioning. It is controlled by a switch or thermostat, conditioning only the area to be used. The new model features a motor control which is flush with the outside of the cabinet. The manufacturer states it requires little or no ductwork. Other features include piping connections brought directly to the outside of the unit, a side drain, and a removable lower panel. It fits into a small enclosed space in a wall or above a hallway or closet.



Manufacturer—Drayer-Hanson, Inc., 3301 Medford St., Los Angeles 63.

Electrostatic Filter for Air Conditioners

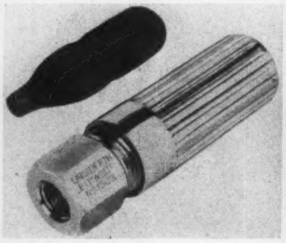
Air conditioner filter with an electrostatic pickup action. . . . It is constructed of two layers of fabric made of coarsely woven polyethylene plastic fibers locked in a metal frame which fits into the room air conditioner. In operation, friction of the air drawn through the plastic filter material sets up an electrostatic charge that attracts and traps microscopic particles of dirt, dust, pollen and animal life, says the manufacturer. It is cleaned by cold water rinsing.

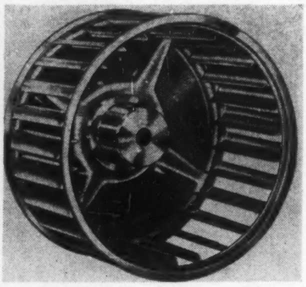
Manufacturer — Hotpoint Co., 5600 W. Taylor St., Chicago 44.

Blowout Gun for Transmission Lines

Blowout gun for cleaning out transmission lines redesigned to incorporate a ¼ in. female pipe connection. . . . The gun was primarily designed for use on the company's instruments and controls whose transmission lines may become restricted with heavy oils and sediments. However, it is also used for blowing out fuel or oil lines. The gun is intended for use on lines capable of withstanding 100 lb per sq in. pressure, and vented beyond the restricted point to the atmosphere, either directly or through a fluid. In operation, after disconnecting the indicator, the tube fitting is tightened to the adaptor. A CO_2 cartridge is inserted into the holder which is then screwed down tight. This forces the end of the cartridge against the firing pin and releases the pressurized gas to blow out the restriction.

Manufacturer — Liquidepth Indicators, Inc., 43-22 Tenth St., Long Island City 1, N. Y.





Above: Gun

Right: Wheel

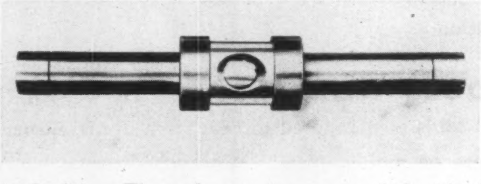
Blower Wheels for Oil Burners

Two new sizes of blower wheels, "AIRotor," designed for oil burner applications . . . . The wheels are being produced in 5⅛ and 5¾ in. diameters. The 5⅛ in. size, designated "Series 504", is available in widths of 1⅛, 2 1/16, 2 15/32, 2⅞, 3 1/8 and 3½ in. The 5¾ in. wheel, "Series 524," is being manufactured in widths of 1 5/32, 2 1/16, 2½, 2 29/32, 3⅛, 3½, 3 25/32 and 4¼ in.

Manufacturer—The Torrington Mfg. Co. 70 Franklin St., Torrington, Conn.

Sight Glasses for Refrigerant, Other Lines

"5000 Series" liquid indicators using high pressure "Pyrex" glass tubing sized to liquid line capacities for full flow of the refrigerant or other fluids . . . . The liquid is visible at the double port openings in the housing. The tight seal between the glass and housing is maintained by springs, contained within the housing, pressing against the gaskets and assisted by the fluid pressure in the line. The end extensions are sealed with plastic plugs so that no oxidation of the copper occurs. The manufacturer states that silver alloy brazing metals may be used for making tight joints without dismantling the unit. The new series is available in copper tube sizes from ¾ in. through 2⅛ in. and in iron pipe threads from ½ through ¼ in.



Manufacturer—Allin Mfg. Co., 1153 W. Grand Ave Chicago 22.

Welding Hose Reel

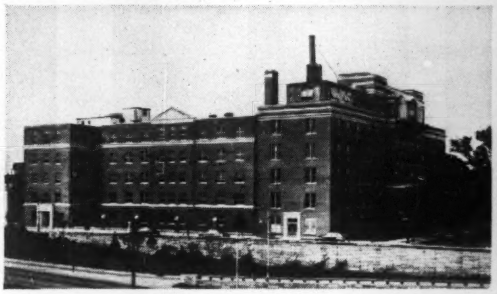
Compact welding hose reel to handle 50 ft of dual welding hose . . . . The "Weldreel" can be

[*Continued on page* 240]

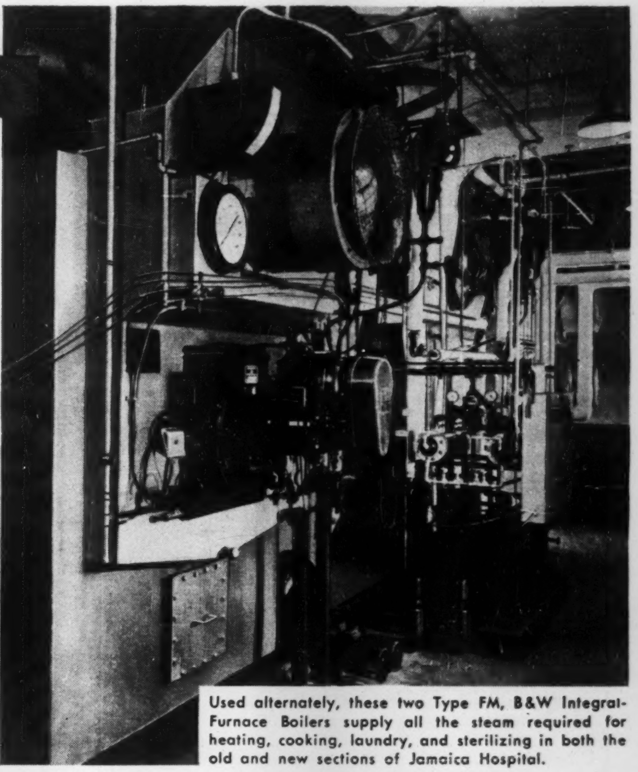
keeping steam cheap . . .

at JAMAICA HOSPITAL

with TWO B&W TYPE FM BOILERS



Otto J. Sambach, Consulting Engineer,
Bessel and Matz, Architects.



Used alternately, these two Type FM, B&W Integral-Furnace Boilers supply all the steam required for heating, cooking, laundry, and sterilizing in both the old and new sections of Jamaica Hospital.

With the opening of its newly completed addition in 1952, Jamaica Hospital in Queens, N.Y.C., was expanded to a 270-bed institution with completely modern surgical and maternity facilities. Architecturally, the five-story and basement structure is a pleasant blend of old and new buildings having a total of 652 rooms for all purposes.

As with all hospitals, the choice of a fully reliable and efficient steam generator to supply the various services was vitally important. To meet the stringent hospital requirements, two B&W Integral-Furnace Boilers, Type FM — each of 10,000 lb per hr steam capacity — were placed in service in June 1952. These oil-fired units are under completely automatic control — operate with minimum supervision. Used alternately, each FM Boiler carries the full steam load throughout the hospital . . . supplies sufficient steam for all heating, hot water, kitchen, laundry, and sterilizing requirements. Additionally, they supply steam and hot water through underground lines to a nurses' residence and a separate residence for employees a city block away.

COST-SAVING FEATURES

- Saves Erection Time and Cost
- Meets Wide Range of Service
- Handles Quick Load Changes
- Fast Steaming
- Low Maintenance
- Easy Accessibility
- Burns Oil and/or Gas
- Saves Fuel
- Saves Space
- Safe, Automatic Operation

After almost two years of experience with these compact, economical FM units, Chief Engineer V. Petersen, his Assistant Chief F. Zwiesler, and the operating crew report complete satisfaction with their performance. Along with other hospitals in various parts of the country, the new Jamaica Hospital has found the B&W Type FM Boiler ideally suited to its needs.

The already wide and steadily growing popularity of this shop-assembled B&W Boiler for a broad range of industrial, commercial, institutional, and other applications, is attested by the units now in service or on order, having a total steam capacity of over 7,000,000 lb per hr. The versatile FM is available in standard sizes for loads ranging between 2,900 and 28,000 lb of steam per hr at pressures to 235 psi.

Get the full story of this unusual small boiler. Write for Bulletin G-76A for a detailed, illustrated description of its cost-saving features. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York, 17, N. Y.

BABCOCK & WILCOX

B&W
BOILER DIVISION

G-637

KING OF THEM ALL

BRUNER

WATER SOFTENERS AND FILTERS

Examples of Bruner industrial installations:

INDUSTRIAL

Chevrolet Division GM—Flint, Mich.
Halle Bros. Dept. Store —Canton, O.
Havana Laundry—Havana, Cuba

MILITARY

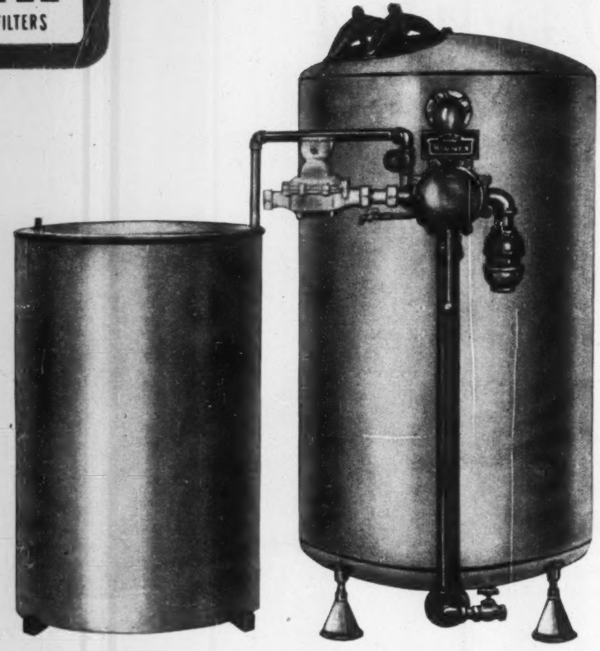
Wright Patterson Air Force Base
—Dayton, Ohio
Big Spring Air Force Base—
Big Spring, Texas

HOTELS and HOSPITALS

Jung Hotel—New Orleans, La.
Gulf Bay Hotel, Sarasota, Fla.
Exeter Memorial Hospital—
Exeter, Calif.

SCHOOLS and COLLEGES

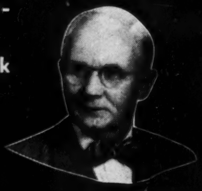
University of Wisconsin—
Madison, Wis.
University of Missouri—
Columbia, Mo.
Peabody High School—Trenton, Tenn.



Water Softeners for Industry

Bruner Corporation has probably already installed an industrial water softener of the type and size that would be just right for *your* plant or building. Hundreds of industrial, military, municipal, and power plant installations from coast to coast, in Canada, Alaska, and South America have proven the superior performance and economy in original cost of Bruner water conditioning equipment.

Softeners with capacity up to 1,500,000 GR can be delivered from stock with important savings in time and money.



Treatment of unusual water conditions, sometimes requiring specially designed equipment, is the daily work of Dr. R. Lee Jickling, noted authority in this field and Chief Chemist at Bruner Corporation. Your correspondence will receive his immediate attention.

BRUNER CORPORATION

General Offices — MILWAUKEE, WIS.
Plants in Milwaukee and
El Segundo, Calif.

MEMBER

World's largest manufacturer of fully automatic water softeners — for home and industry.

Points to look for when you select a Packaged Boiler:

1 Fiberglas insulation with metal jacket and metallic paint finish.

2 Lift lugs for convenient handling on job site.

3 Boiler shell made of flange quality steel. All joints electrically welded. High pressure shells X-rayed to insure flawless construction and long life.

4 Separator to assure dry steam supply (99%+).

5 Practical front-end construction provides open flow of combustion gases to stack. No refractories to maintain. Entire burner front hinged, providing easy access to fire tubes.

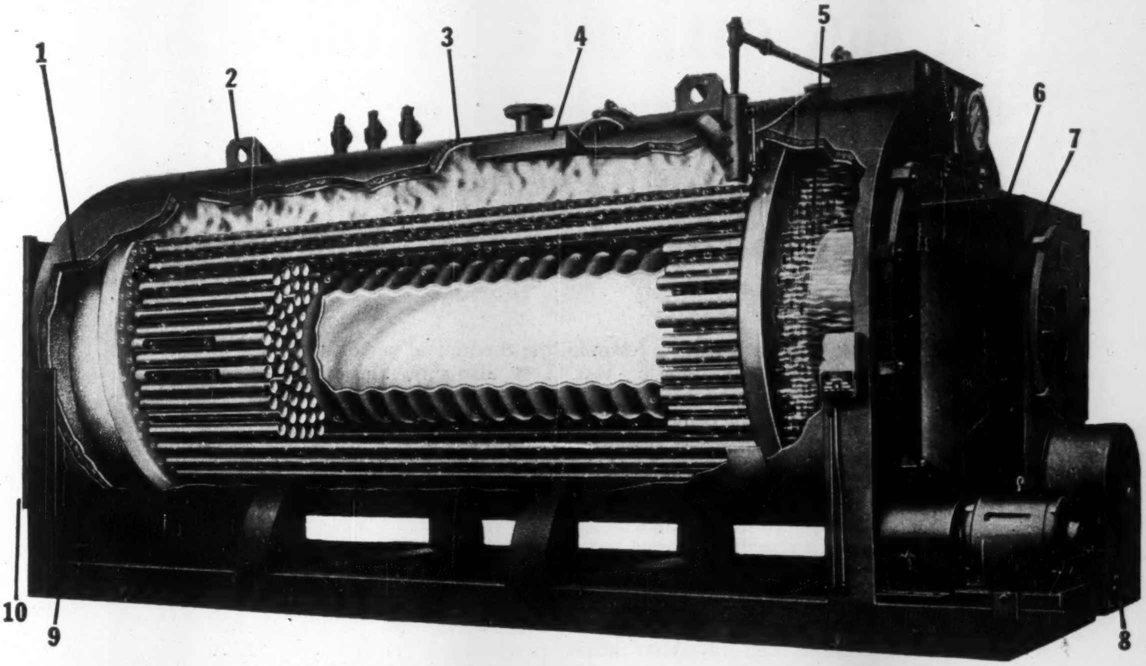
6 Burner and its vital parts—such as fuel nozzles, flame scanner and ignition assembly—fully enclosed in steel housing for safe operation.

7 Dual air-flow burner—for oil or gas fuels—precisely fitted to the boiler furnace. Burner specially designed to mix fuel and air for high combustion efficiency. Heat transferred directly to water surrounding the furnace.

8 Air for the burner passes through an inlet silencer to a forced draft fan. Air flow controlled by adjustable dampers.

9 Structural steel base distributes weight evenly on boiler room floor. No special foundation required.

10 Hinged rear door lined with insulating refractory. Door can be opened in a few minutes—affording access to furnace and all return tubes. No need to remove and replace refractory baffles or brick work. Note sturdy hinge construction which insures positive seating of door.



The CONTINENTAL Automatic Boiler

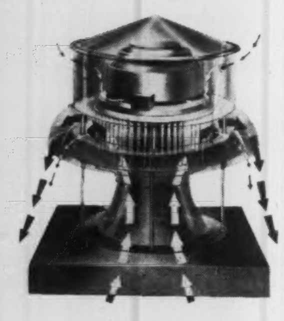
- **Two-pass design—simple and practical. Range 20 to 500 hp.**
- **Factory-tested before shipment. Guaranteed 80% efficiency.**
- **Maximum radiant heat transfer from flame to water-cooled furnace walls.**
- **Even heat transfer—uniform flow of hot combustion gases through all return tubes.**
- **Free and rapid water circulation keeps all heating surfaces clean and improves transfer of heat to boiler water.**
- **High CO_2 and low stack temperature—guaranteed not to exceed 125°F. above saturated steam temperature at operating pressure.**

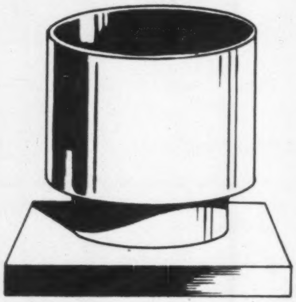
CONTINENTAL BOILER DIVISION
BOILER ENGINEERING & SUPPLY COMPANY, INC.
1000 Manavon Street • Phoenixville, Pa.

40 YEARS OF BOILER MANUFACTURING EXPERIENCE

CONTINENTAL is sold, installed and serviced by competent distributors throughout the U.S.

BOTH of these Power Roof Exhausters are rated at 3600 CFM (free air)





but only GALLAHER Air-Van with a built in Scroll Effect design can deliver reasonable volume against normal static pressure

When ratings are predicted from a formula, the theoretical performance curve does not hold up against an actual physical test. Tests also show that other uncalculated factors drastically alter air output.

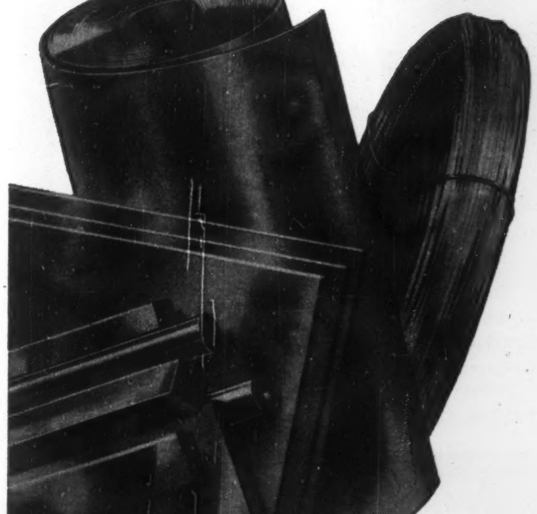
Actual physical tests have shown that unless scroll effect is present, reasonably efficient performance against even ¼″ static pressure is impossible. And further studies have shown that performance of power roof exhausters cannot be predicted for even slight modifications in design. Errors may be more than 50%. But not in a Gallaher Air-Van. Gallaher relies on actual physical tests. When a Gallaher unit is rated to deliver a specified volume against a specified static pressure, the unit has been test-proved.

Gallaher research in built-in scroll effect, in safe-fume removal, direct connection and weatherproof design—is why engineers everywhere are turning to Gallaher for the answer. Gallaher can solve your industrial ventilation problem. For full catalog information write,

The **GALLAHER** ***Company***
4108 Dodge St. Omaha, Nebr.

DON'T FORGET!
HUSSEY COPPER
ATCHES YOUR SPECIFICATIONS

Sheet • Strip • Coils
Rods • Wire • Tubing
Bars • Anodes



YOU actually drew the specifications for Hussey Copper through years of establishing precise requirements for production or performance in your products.

Today there is hardly a specification that is not fully met by the many sizes, types and grades of Hussey Copper in all its forms. Whether it is accurate dimensions, temper, form or general adaptability, you can depend entirely upon Hussey Copper.

Better still, Hussey Copper is widely stocked in all industrial areas and is readily available. Specify Hussey Copper for all your projects with confidence.

C. G. HUSSEY & COMPANY
(Division of Copper Range Co.)
ROLLING MILLS AND GENERAL OFFICES, PITTSBURGH 19, PA.

AVAILABLE FROM SEVEN WAREHOUSES

PITTSBURGH (19)
2850 Second Avenue
CLEVELAND (14)
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140 Sixth Avenue
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ST. LOUIS (3)
1620 Delmar Boulevard
PHILADELPHIA (30)
1632 Fairmount Avenue
CINCINNATI (2)
424 Commercial Square

is something
ALWAYS
missing?
(to cut your profit)

...then switch to the one line that meets every selling need

* **EXAMPLE No. 4:** You gain three advantages—*profitwise*—when you sell the Bryant line. First, because it's a *quality* line, Bryant discount structures are arranged to give you the highest and broadest profit margins. Second—and again because it's a quality line—Bryant protects your earnings against profit-shrinking "call backs". Last, because it's the most complete line of heating, air conditioning and water heating equipment in the industry, Bryant gives you *more* opportunities to make sales—*and profit!*

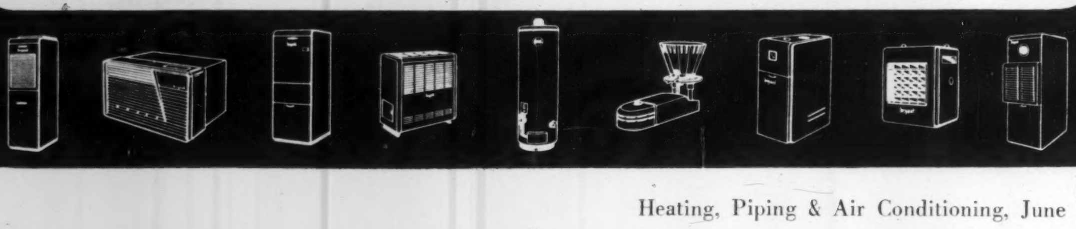
Your nearby Bryant Distributor has complete details. It will pay you to call him today.

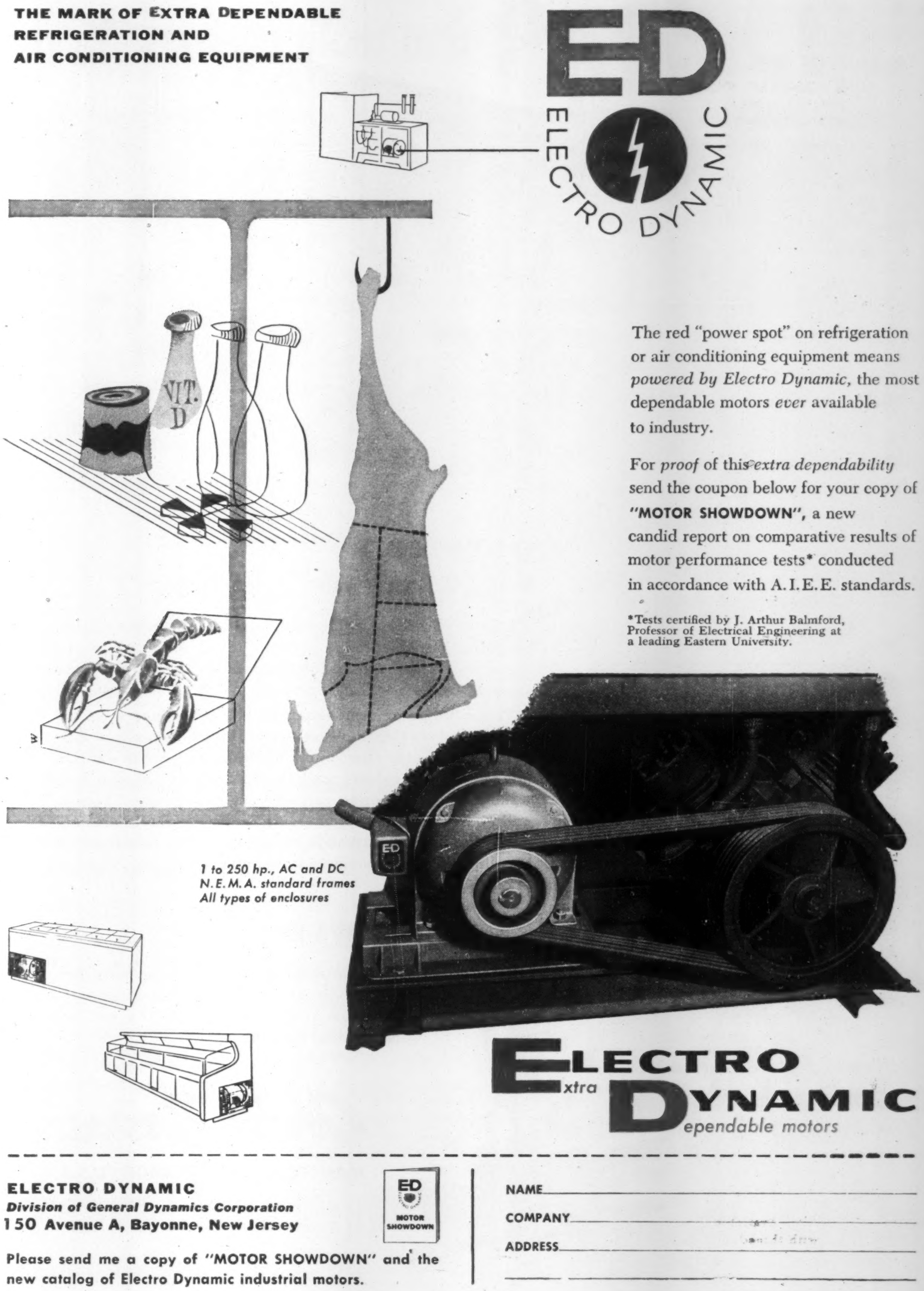
bryant®

HEATING AIR CONDITIONING WATER HEATING

1. The most complete line in the industry
2. Quality products—Competitively priced
3. Established name—Good customer acceptance
4. * Broad, attractive profit margins
5. Local Distributor warehousing and service
6. Factory district representatives and traveling sales training and service teams

Bryant Heater Div., Affiliated Gas Equipment, Inc., 17825 St. Clair Ave., Cleveland 10, Ohio





THE MARK OF EXTRA DEPENDABLE REFRIGERATION AND AIR CONDITIONING EQUIPMENT

ED
ELECTRO DYNAMIC

The red "power spot" on refrigeration or air conditioning equipment means *powered by Electro Dynamic,* the most dependable motors *ever* available to industry.

For *proof* of this *extra dependability* send the coupon below for your copy of **"MOTOR SHOWDOWN"**, a new candid report on comparative results of motor performance tests* conducted in accordance with A. I. E. E. standards.

*Tests certified by J. Arthur Balmford, Professor of Electrical Engineering at a leading Eastern University.

1 to 250 hp., AC and DC
N. E. M. A. standard frames
All types of enclosures

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Division of General Dynamics Corporation
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Please send me a copy of "MOTOR SHOWDOWN" and the new catalog of Electro Dynamic industrial motors.

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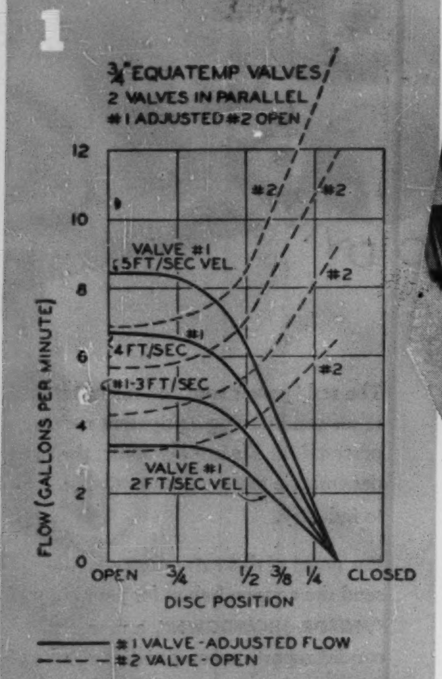
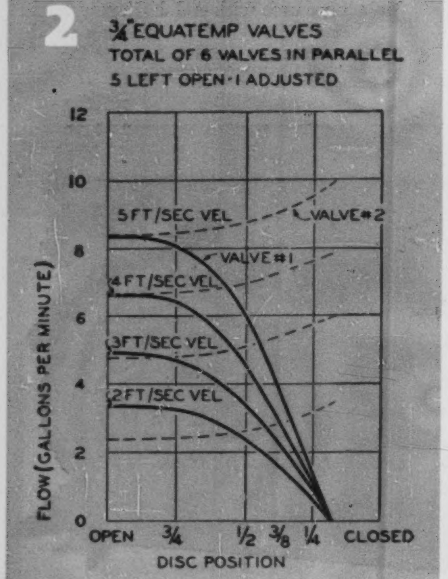
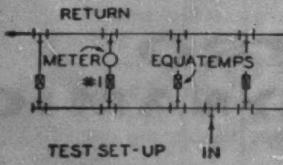
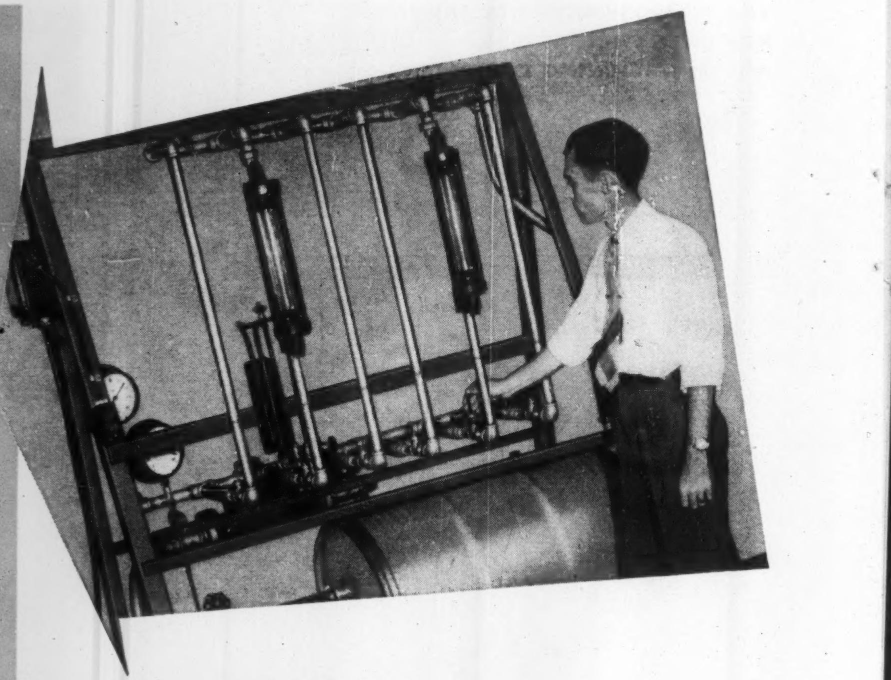








QUESTION:

Does A Balancing Valve Really "Balance"?

Moving the disc in the O-B Equatemp® Balancing Valve has a definite effect on flow...both in the line in which the valve is installed and on flow in parallel lines in the same system.

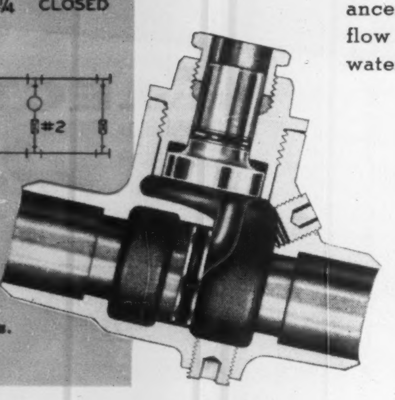
That's the point demonstrated by O-B engineers on the special test device pictured here. The charts show how the test works. In chart one, one Equatemp is moved from full open to full closed position. As the valve closes, flow through a parallel open valve begins to increase. The second chart shows the same results when six valves are connected in parallel, although the effect of the adjustment is less because it is distributed over five other lines instead of one.

ANSWER:

An Equatemp Balancing Valve really balances. It can be used effectively to regulate flow in year-around air conditioning and hot water heating systems.

Ohio Brass

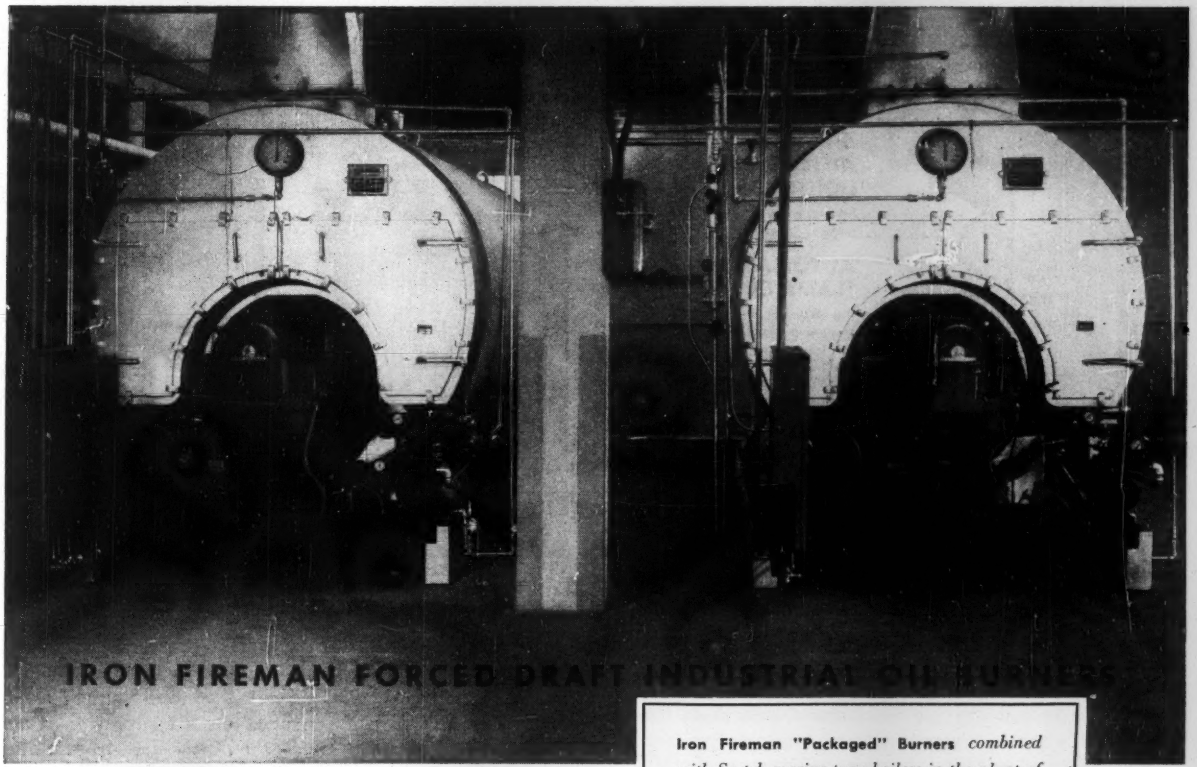
MANSFIELD OHIO, U.S.A.



Also available with threaded ends.

4462-V

Buy your steam plant in a PACKAGE



Iron Fireman "Packaged" Burners *combined with Scotch marine type boilers in the plant of Belrug Mills, Inc., Greenville, S. C. Installation by Kirby Hammond, Inc., Greenville. Race, Forrester & Etting, Architects and Engineers.*

No divided responsibility . . .

No separate contracts for (1) boiler setting
(2) electrical wiring (3) oil heating equipment
(4) automatic control system (5) forced draft system
(6) boiler refractory

How to specify. First, decide what fuel or fuels you want to use (oil, gas or oil-gas combination). Second, determine the load. Third, refer to table in Iron Fireman catalog or specifications for the correct size of burner and boiler for your job.

The entire burner unit is assembled and tested at the factory, and is shipped to you ready for bolting to the boiler. Packaged unit includes: Iron Fireman oil, gas or combined oil-gas burner; wired and tested control panel; oil heating system; built-in forced draft with integral fuel and air controls.

Buy burner and boiler as integrated unit. You can install a complete new boiler plant quickly and economically by specifying an Iron Fireman packaged burner and a Scotch marine type boiler engineered specifically for use with this unit. Forced draft; no high stack required.

Or convert any old or new boiler.

This completely integrated combustion system can be installed in practically any type of existing boiler, with important savings in installation and operating costs.

The smart way to modernize. This Iron Fireman firing unit is much more than just a burner. It's a complete combustion system. To the user this means big savings in installation time and costs. But even more important, it means a factory built and tested unit instead of a locally assembled job. It means direct factory responsibility; high operating efficiency; substantial fuel savings. Send the coupon below for more information, or call your Iron Fireman dealer.

IRON FIREMAN MANUFACTURING CO.
3069 W. 106th Street, Cleveland 11, Ohio.

Please send detailed information on Iron Fireman packaged burner units for oil, gas and oil-gas combination firing.

Name______________________________

Address____________________________

City__________________State

Iron Fireman®

Oil, Gas, Coal firing for Heating, Processing, Power

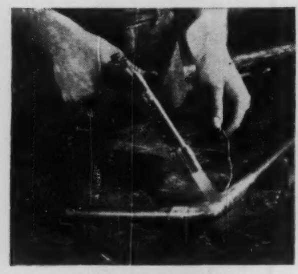
AUTOMATIC LIGHTING—
Ignites at a trigger-touch

AUTOMATIC FLAME CONTROL—
the stronger the trigger squeeze, the longer the flame

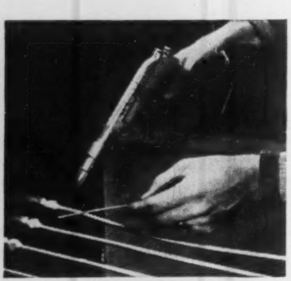
AUTOMATIC SHUT-OFF—
release, it's out!

THE NEW PROPANE TORCH-O-MATIC

The Propane Torch-o-matic's *exclusive* trigger control, which *automatically* ignites the torch, controls the length of flame to suit any job requirement, and shuts the flame off when the trigger is released, brings new savings and safety to soldering, brazing, sweating, and other jobs. There's no waiting to get the job started . . . just squeeze the trigger, and you're ready to go. Pressure on the trigger varies flame from a fine, pinpoint flame to a full 6-inch long flame. This instant start, instant control, save you time on every job. When the trigger is released, the flame is out. This means important savings in gas, and greater safety.



Pull on trigger gives full flame



Easing-up on trigger gives pinpoint flame

• Write for facts now on this faster, easier, safer torch that saves gas, time. Unit connects directly to your propane tank—no intermediate valve fittings.

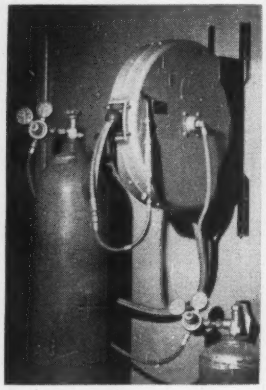
VELOCITY POWER TOOL CO.
201 North Braddock Avenue, Pittsburgh 8, Pa.

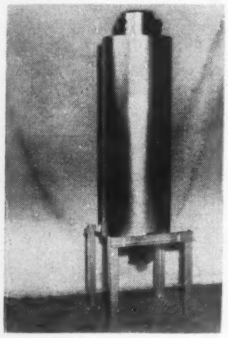
EQUIPMENT DEVELOPMENTS

Continued from page 230

attached to portable or stationary equipment by two universal brackets. The manufacturer states that the reel locks the hose in position at any desired length and automatically retracts the hose when the reel is not in use. The reel is available for 50 ft of 3/16 in. or 40 ft of ¼ in. dual welding hose.

Manufacturer—United Specialty Corp., P. O. Box 698, El Dorado, Ark.





Above: Filter
Left: Reel

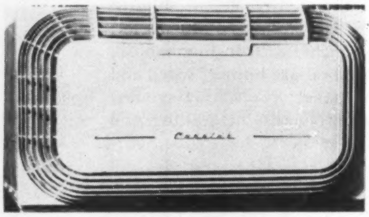
Dual Purpose Air Line Filter

"Dual Duty" filter designed to prevent pressure drop in air lines as well as to remove moisture and oil. . . . This filter, installed in an intermediate position or at the end of an extended line with a check valve, is said to provide an adequate air supply in spots which previously were affected by pressure drop. The outer steel cylinder is tested to withstand a hydrostatic pressure of 600 psi, according to the manufacturer. The inner cylinder, comprising the filter element, is packed with fiber glass. In operation, the unit serves as a combined auxiliary receiving tank and filter. A 1 in. drain at the bottom of the outer cylinder removes accumulated moisture and oil.

Manufacturer — Airlenco, Inc., 198 Wayne St., Mansfield, Ohio.

Room Air Conditioners

Line of 1954 room air conditioners designed to combine new styling, versatile installation and higher performance standards . . . . Window models are available in 1/3, ½, ¾ and 1 hp sizes. Console models are supplied air cooled in 1 and 1½ hp sizes, and in a 1 hp water cooled model. All units from ½ hp up are equipped with thermostats for automatic regulation of temperature. Window model thermostats have four weather control positions. Controls under the hinged



For Step No. 3 in perfecting air conditioners . . .

L·O·F FIBER·GLASS for Noise Control

1. Cooling

2. Dehumidifying

In Step No. 3—the control of noise—air-conditioning engineers tell us that two kinds of L·O·F Fiber·Glass are indicated;—

One is the same basic material now used as thermal insulation for air-conditioning ducts—flexible, blanket-type L·O·F Super·Fine Fiber·Glass. This provides high-efficiency *sound* insulation; absorbs airborne sounds in the middle- and high-frequency ranges. Vinyl-faced Super·Fine is specified for highest sound-absorbing efficiency.

To reduce noises created by vibration, L·O·F now makes available High Density Compressed Fiber·Glass. This is a new form of compressed, high density Fiber·Glass which can be molded, if desired, into shapes. It can be used to form blower housings and air intake deflectors, and to line cabinets.

L·O·F Fiber·Glass in both forms is easily handled, easily cut and easily installed. The fine glass fibers will not burn, absorb moisture, mildew or rot.

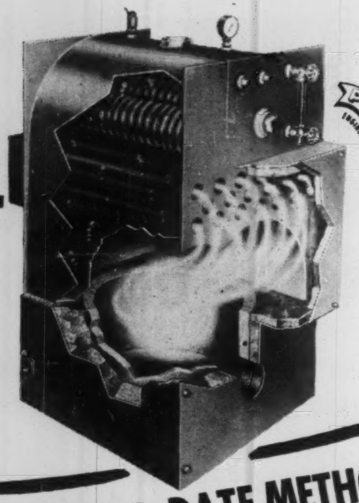
For consultation on applying both L·O·F Super·Fine and L·O·F High Density Compressed Fiber·Glass to air conditioning units, call your nearest L·O·F office (offices in 26 major cities). Or write: Libbey·Owens·Ford Glass Company, Fiber·Glass Division, 3964 Wayne Building, Toledo 3, Ohio.

SUPER-FINE INSULATION
LOF
FIBER-GLASS

3. Controlling Noise

FIBER · GLASS

LIBBEY·OWENS·FORD GLASS COMPANY
FIBER·GLASS DIVISION



PORTMAR ENGINEERED QUALITY STEEL BOILERS

MOST UP-TO-DATE METHOD OF SATISFYING VOLUME HOT WATER REQUIREMENTS

in...
apartment houses, restaurants, hotels, hospitals, office buildings, schools, factories, processing plants, etc.

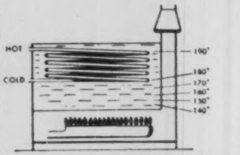
WH SERIES
Oil or Gas Fired
9 Sizes—350,000 to 1,650,000 BTU/hr.
Hot Water Delivery: 300 to 5,000 G.P.H.

H A.S.M.E. APPROVED

PORTMAR Twin Coil Volume Water Heater Eliminates the Storage Tank!

★Instantaneously and automatically delivers large quantities of sanitary hot water through copper coils.

Here's a clean, compact, low-cost installation that operates with exceptional economy . . . reduces high maintenance, utilizes valuable space. The heater's fast hot water circulation makes the unit self-cleaning, causes quick temperature pickup, needs no recovery time. Supplies two temperature hot water: 140° for general use; 180° for sterilizer-rinse.



ADVANTAGES OF THE INDIRECT (TANKLESS) HOT WATER SYSTEM

Protected by free-circulation water, the submerged twin coils never come in contact with intense burner heat, which of course, shortens the life of direct systems. In indirect systems, the coils are the highest point in the water heater circuit. The hottest water rises as it is heated, transferring heat to the twin coils. Water flowing through the coils is instantly heated for immediate use.

Write for literature and prices

Portmar Boiler Company Inc.
193 Seventh Street, Brooklyn 15, N. Y.
Residential, Commercial, Industrial Water Heaters and Heating Boilers, Vertical, Horizontal Tubular Boilers • Rotary Flame Boilers

EQUIPMENT DEVELOPMENTS

Continued

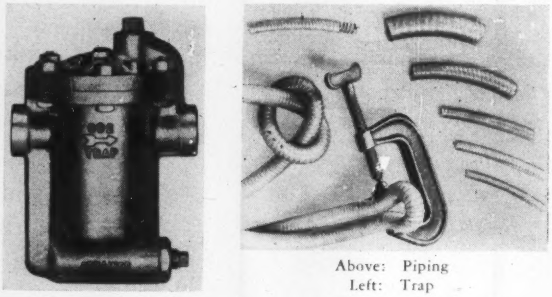
louver panel may be set to provide ventilation with outside air, and circulation and filtering without cooling and dehumidification. According to the firm, major improvements include high cooling and dehumidifying action under all conditions, greater quietness and closer control of circulating air. Adjustable louvers in the hinged grille panel permit directional control of air circulation.

Manufacturer—Carrier Corp., 300 S. Geddes St., Syracuse 1, N.Y.

Integral Strainer Steam Trap

Large model, "No. 882," of company's line of integral strainer steam traps, for use where dirt and scale conditions are bad . . . . A stainless steel strainer screen is located in the body casting at the bottom of the trap. It has horizontal and opposite pipe connections of ½ in. or ¾ in. size. Capacity ranges from 1300 to 2200 lb per hr of condensate and maximum operating pressure is set at 250 psi. The strainer bushing has straight threads and there is a copper asbestos gasket between the bushing and body to prevent rusting-in or "freezing."

Manufacturer—Armstrong Machine Works, 874 Maple St., Three Rivers, Mich.



Above: Piping
Left: Trap

Translucent Plastic Piping

"Armourvin," an industrial piping made of transluscent plastic. . . . A 120 ton tensile helical steel wire is imbedded in the wall of the piping to prevent it from coming in contact with any liquids or gases either inside or outside the piping. The wire is designed to make the piping almost uncrushable. According to the manufacturer, the piping will bend around a 5/16 in. diameter spindle without reducing its internal bore and will remain flexible and will withstand temperatures up to +70 C and down to −40 C. In addition, it is said to be resistant to water, oil, grease, most acids and alkalies, diesel fuel, coal and butane gases. A variation of the piping, called "Armourflow," is designed to handle gasoline and other highly volatile fluids. Outside diameters range in size from ⅜ in. to 1 in.

Manufacturer — Newage International, Inc., 235 E. 42nd St., New York 17.

Pumps for Boiler Pits

Two new automatic drainers for emptying water from basements, elevator and boiler pits. . . . The standard type, "DSM," is driven by a 1/3 hp, 115 volt, 60 cycle, single phase NEMA motor actuated by non-corrosive displacer bobs which are adjustable on a

GREATEST ADVANCE IN AIR CLEANING ECONOMY

These precision stamped filter openings make possible EVANS PRECISION AIR CLEANING.

LABORATORY TESTS PROVE

LOWEST OPERATION AND MAINTENANCE COST PER LB. OF AIRBORNE DIRT REMOVED

New All Aluminum

Evans

Lifelong

AIR FILTERS

EVANS HIGH CAPACITY PRECISION AIR FILTERS have set a new standard in air cleaning. Actual installation performance is so superior it has amazed engineers on every application. Here are some of the secrets of this performance.

- **76,060 AIR SCOOPS (IN 20″ x 20″ x 2″ SIZE)**

  An exclusive Evans feature that creates higher turbulence . . greatest air travel . . air is forced to pass over a tortuous path of 1.24 miles of precision stamped talon like edges . . up to 3.5 times filter depth.

- **LARGE FRONT FILTER OPENINGS**

  Provide low resistance storage capacity for fibers contained in normal airborne dust.

- **CLEANED WITH HOSE IN MINUTES**

- **MERCHANDISING POLICY GUARANTEES TERRITORY PROTECTION**

  Adds profits — sales — gives new greater customer satisfaction.

If you are responsible for specification, installation or sales of filters, by all means take action. Get the Complete Evans story now.

WRITE or Call Today

THE GEORGE EVANS CORPORATION, MOLINE, ILLINOIS

GENTLEMEN: Please send me: ☐ **Descriptive Literature**

☐ **Merchandising Policy** ☐ **Price Lists**

I WANT TO LEARN HOW TO MAKE MONEY OUT OF THE FILTER BUSINESS.

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THE BIG DIFFERENCE IN PACKAGE BOILERS

CYCLOTHERM* CYCLONIC COMBUSTION gives you 66% MORE POWER per sq. ft. of heating surface

The cyclonic action of the flame revolves evenly in a free spiraling vortex the full length of the furnace and provides an even rate of heat transfer throughout the entire length of the combustion chamber.

This controlled combustion reduces heating surface requirements from 5 to just 3 sq. ft. per B. H. P. giving 66% more power.

Plus These Important Features

- Saves up to ⅓ the Space of Conventional Package Units
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- No Hot Spots or Flame Impingements
- Burns Oil, Gas or Both
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And That's Not All . . .

Cyclotherm Steam Generators with *patented* Cyclotherm Cyclonic Combustion gives you: Full power operation from a cold start in 15 to 20 minutes; Built in accordance with A.S.M.E. and Nat'l. Board Standards and bears the label of Underwriters Laboratories Inc.; Complete range of sizes from 18 to 500 h.p., 15 to 200 psi operation pressure.

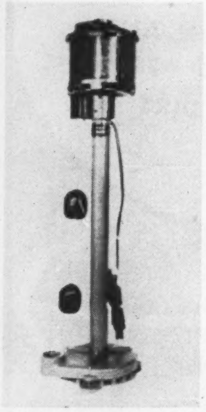
WRITE TODAY for your copy of "All Your Questions Are Answered by Cyclotherm" and find out why Cyclotherm Steam Generators have been proven superior in thousands of installations. Just drop a post card to Cyclotherm, Dept. 126 Oswego, New York.

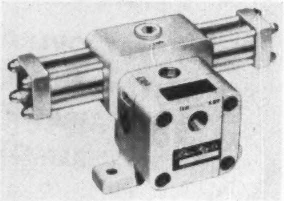
*Reg. trade name

CYCLOTHERM STEAM GENERATORS

stainless steel wire. The entire pump, including support columns, is made of bronze, except the shaft — which is of stainless steel. Type "DSS" is an entirely submersible unit with the motor encased in a stainless steel shell that serves as an adjustable float control. Both pumps use bottom suction, semi-open non-clogging type impellers, 1¼ NPT vertical discharge. The pumps are designed to handle from 180 gph against a 24 ft head to 3700 gph against a 6 ft head.

Manufacturer — The Aurora Pump Co., 619 Loucks St., Aurora, Ill.





Above: Valve

Left: Pump

Valves for Actuating Cylinders

Two new disc type power operated valves designed for actuating remotely located or automatically operated cylinders. . . . Available in two and three position, these valves have a "free floating" piston movement to solve alignment problems. Other features, according to the manufacturer, include a floating piston bar, use of pilot valves for interchangeable control combinations, power return to all positions and the use of non-corrosive materials allowing operation by air, gas, oil or water. The power operated valves are built in sizes from ⅜ in. to 1¼ in. standard pipe connections.

Manufacturer—Ledeen Mfg. Co., 1600 S. San Pedro St., Los Angeles 15.

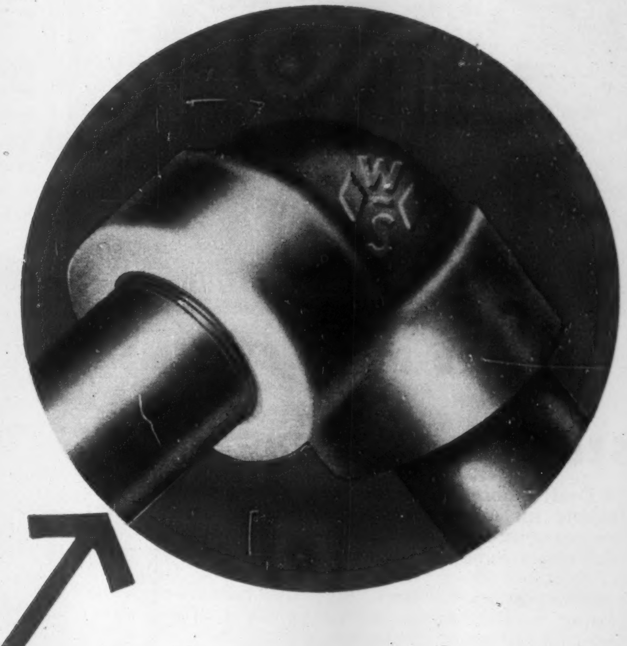
Backward Curve Blower

Backward curve blower manufactured in all NAFM recommended sizes from 12½ in. to 36½ in. with self limiting horsepower characteristics. . . . One of its features is a dynamically balanced wheel designed to permit smooth, quiet entry, passage and exit of air. A heavy cast iron hub provides total support and is said to assure maximum balance throughout blower life. Housings are available for outdoor installation.

Manufacturer — The Peerless Electric Co., Fan and Blower Div., 1401 W. Market St., Warren, Ohio.

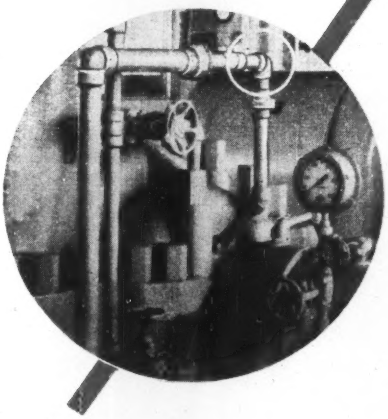
Lightweight Sump Pump Motor

New sump pump motor, 25 percent lighter than company's previous models . . . . Meeting NEMA standards for sump pumps and cellar drainers, the new open drip-proof motor is equipped with drip cover, built in switch and bottom flange for direct mounting. Between-



CLOSE-UP VIEW of a HIGH SAFETY FACTOR

Against Costly Piping Failures



In power plants, chemical plants, refineries and other systems operating at high pressures and temperatures, W-S Forged Steel Fittings help protect the large investment in operating equipment. They provide a high safety factor against costly piping failures and plant down-time. They're drop-forged for *high strength* and *toughness*—the right combination of properties to withstand pressure, heat, shock, vibration and erosion. They're designed for extra strength, too—with extra heavy sections where you need them. And they're precision machined for perfect alignment.

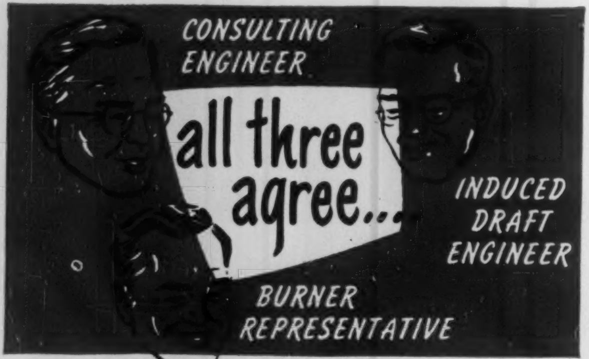
Make Watson-Stillman Forged Steel Fittings your standard for safe, reliable operation of plant equipment. To suit any service and fabrication requirements, W-S Fittings are available in both Screw-End and Socket-Welding types in carbon, stainless and alloy steels. Write today for informative bulletins.

Sold Through Leading Distributors

WATSON-STILLMAN FITTINGS DIVISION

H. K. PORTER COMPANY, INC.

Roselle, New Jersey



INDUCED DRAFT SYSTEMS *need* SELECTED STARTING DRAFT!

A Draft Inducer is designed to provide a constant draft supply for maximum stack requirements. Without proper controls, it delivers maximum draft at all times. But under some conditions, this maximum draft needs correction—in particular during initial light off, whether on low-fire start, "high-low" burners or modulating burners, where excessive draft often causes starting failure or re-cycling.

CLEVELAND DAMPER CONTROL

provides the 4 CONTROL FEATURES *essential to safe efficient operation of* INDUCED DRAFT SYSTEMS

① **STARTING DRAFT SELECTOR**—providing pre-determined optimum draft for smooth, safe, ignition. When ignition is completed, damper control goes to full, automatic draft regulation.

② **AUTOMATIC DRAFT MODULATION**—maintaining ideal draft for proper combustion under varying firing rates and stack conditions.

③ **AUTOMATIC SEQUENCE OPERATION**—providing proper draft for all phases of firing cycle, with proper shut-off of draft during "off" periods.

④ **LOW DRAFT CUT-OFF**—providing the safety of an integral minimum draft switch that shuts down firing at unsafe low draft limits. Time-delay feature prevents nuisance shut-downs due to momentary puffs.

Only CLEVELAND DAMPER CONTROL can give ALL 4!

Write for complete information.

The CFE line includes damper controls, steam controls, electronic smoke detector control units, draft, air pressure and flue temperature gages.

COMBUSTION INSTRUMENTS & CONTROLS
CLEVELAND FUEL EQUIPMENT CO
CLEVELAND OHIO
FOR EFFICIENCY AND ECONOMY

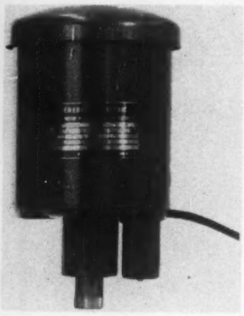
CLEVELAND FUEL EQUIPMENT COMPANY
1111 Brookpark Road, Cleveland, Ohio

EQUIPMENT DEVELOPMENTS

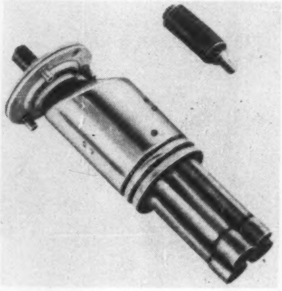
Continued

phase insulation of polyester film is used to provide extra protection against humidity. The stator assembly is protected by a water and heat resistant varnish. Rated at 1/3 hp, the motor is available in 50 cycle, 1425 rpm and 60 cycle, 1725 rpm models.

Manufacturer—General Electric Co., 1 River Rd., Schenectady 5, N.Y.



Pump



Valve

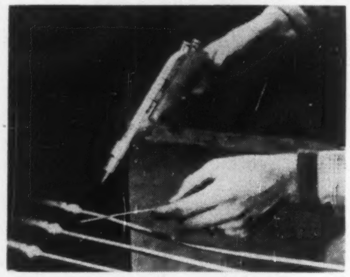
Reverse Flow Valve for Heat Pump

Hermetically sealed, manually operated four-way reverse flow valve for use in window air conditioning units. . . . The valves are designed for use in ¾ ton and 1 ton heat pumps for both heating and cooling rooms. The valve acts to reverse the flow of the refrigerant causing the unit to supply heated air instead of cooled air, or vice versa. The valve contains no packing or synthetic material. A two-ply beryllium copper bellows is used in the valve as a packing seal. The manufacturer states that with the installation of the valve a hermetically sealed system is formed that is capable of reversing its direction without restriction or loss of flow.

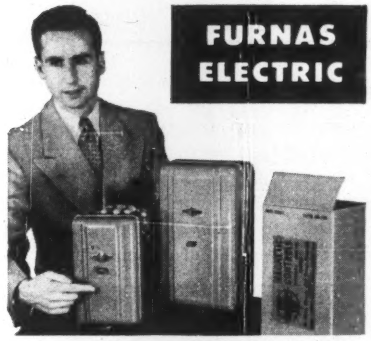
Manufacturer — Robertshaw-Fulton Controls Co., Bridgeport Thermostat Div., Connecticut Ave., Bridgeport 1, Conn.

Propane Gas Torch

"Type P Torch-O-Matic", pistol shaped torch for soldering, burning, sweating, etc., designed for use with propane gas. . . . A squeeze of the trigger produces a controlled flame from a pinpoint to a full 6 in. flame, the maker states. The flame snaps out on release of the trigger. Pumping, priming, heating and waiting are said to be eliminated. The torch connects directly to the propane tank.



Manufacturer — Velocity-Power Tool Co., 201 N. Braddock Ave., Pittsburgh 8, Pa.



Why Pay

FOR STARTER CAPACITY NEVER USED?

THE ANSWER TO THIS QUESTION COULD SAVE hard-earned dollars needlessly thrown away.

When choosing from the widest range of starters in the 1-50 hp range, you save by selecting the starter matched to the job—with no wasted capacity.

Furnas Electric starters—nine of them in the 1-50 hp range—are designed and built to match most applications.

Save 25% TODAY LIKE THIS

Here's an example of typical savings you can earn through proper starter selection: for 10 hp service, for example, you'd select Furnas Electric Type YE rated for the job. This saves you up to 25% on initial costs and 40% on space over a YF size 2 (rated 25 hp) normally selected for 10 hp service.

All of the nine Furnas Electric sizes offer worthwhile savings.

Important FEATURES

Furnas Electric starters give you these additional benefits. *Dual Voltage Coils*—matched to motor voltage. *Thermal Overload Protection. Shallow Case* for easy wiring. *Durability* to stand up under rough service. *Arc Resistant Terminal Board. Arc Quenching Silver Contacts.*

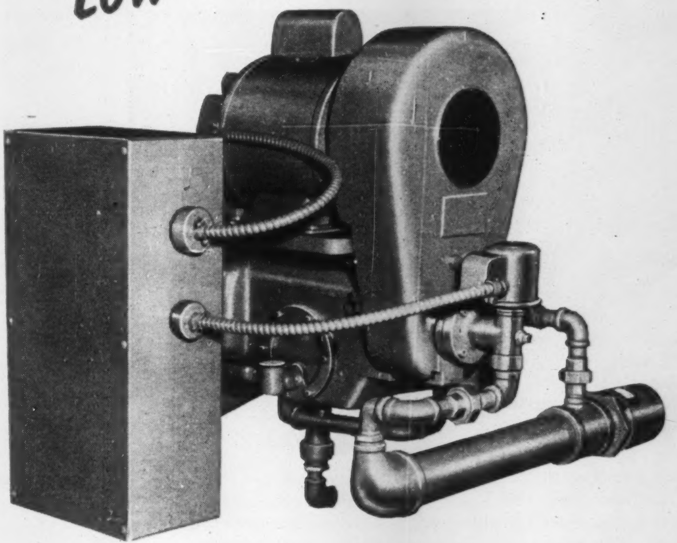
Complete RANGE OF OTHER PRODUCTS

Pressure switches for air and water applications. Drum controllers for reversing, multi-speed and reversing multi-speed service.

Write today for *full story* or contact our representative near you. Furnas Electric Co., 1041 McKee St., Batavia., Illinois.

FURNAS
ELECTRIC
Batavia, Illinois

Here's Dependable Low-Cost Firing



for APARTMENT BUILDINGS COMMERCIAL BUILDINGS INDUSTRIAL BUILDINGS INSTITUTIONAL BUILDINGS

The greatest saving to users of Superior Rotary Burners comes from complete combustion. Accurately metering and atomizing the oil, with primary air perfectly synchronized, Superior Rotary Burners provide firing that squeezes every last drop of heat out of the fuel.

On many installations, additional savings come from the utilization of the heavier, cheaper grades of oil. Superior's preheater and high speed atomizing cup were developed to make the burning of these residual fuels both practical and economical.

Fully automatic firing is another source of fuel savings; for Superior Rotary Burners automatically vary their firing rates to meet the demand for steam, burning only what fuel is needed and never wastefully over-firing.

For light oil, heavy oil, or oil and gas combined, Superior Rotary Burners provide dependable, economical firing. Write for Catalog 1604.

for performance you can **BANK** *on*

SUPERIOR
ROTARY BURNERS

SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

"Our decision was Janitrol Heating

FOR FLEXIBILITY IN PLANT MODERNIZATION"

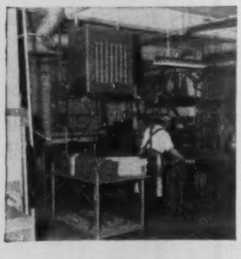
BLAIR ALUMINUM FURNITURE COMPANY
BLAIR CHAIRS

Statement by
D. M. BLAIR,
Plant Superintendent,
Blair Aluminum Furniture Co.,
Marietta, Ga.

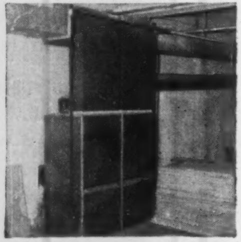
To meet growing demand for Blair office and executive furniture, the Blair Aluminum Company moved into an existing plant with 5-times the previous floor area. The new plant was completely modernized and re-equipped for quantity production of quality upholstered aluminum office furniture.

In planning comfort features into the remodeling, Mr. D. M. Blair replaced the old stoker-fired steam system with Janitrol units. The manufacturing area is heated by 22 Janitrol Unit Heaters and the offices by two Janitrol Winter Conditioners. Mr. Blair selected Janitrol for its flexibility in providing balanced heating in various production areas and for the Janitrol record of trouble-free service with minimum maintenance.

In manufacturing areas, flexible unit heaters are placed to provide balanced heating comfort.



Office areas are heated through ducts from Janitrol Winter Conditioners in adjacent room.



Janitrol
GAS-FIRED UNIT HEATERS

For heating any area, Janitrol Unit Heaters can provide more in performance and overall economy. For full details, write today for "The Businessman's Blue Book for Better Heating".

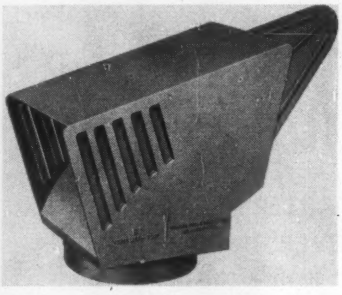
Janitrol Division of
SURFACE COMBUSTION CORP.
Columbus 16, Ohio
In Canada: Alvar Simpson Ltd., Toronto 13, Canada

ALSO MAKERS OF
Surface INDUSTRIAL FURNACES Kathabar HUMIDITY CONDITIONING

EQUIPMENT DEVELOPMENTS *Continued*

Venturi Cap for Draft Correction

Venturi top cap for both heating and ventilating uses and designed to correct poor draft and downdraft. . . . The unit has a throat to change air movement from pressure head to velocity head in order to supply sufficient updraft to maintain normal overfire draft. The streamlined vane and hood are mounted on a pivot which is sealed for life and oil impregnated, the manufacturer states. This design maintains a position away from the wind so that downdraft cannot enter the chimney. Specifically designed for gas venting are six different sizes: 3, 4, 5, 6, 7 and 8 in.

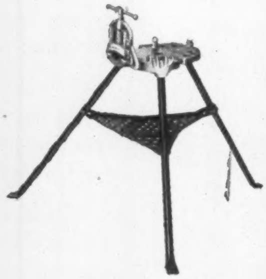


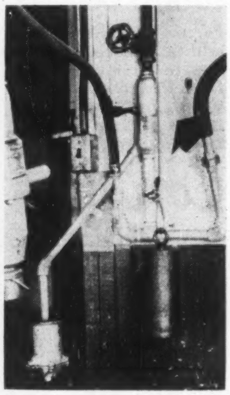
Manufacturer — Walker Mfg. & Sales Corp., 1711 Penn St., St. Joseph, Mo.

Pipe Vise with Tool Tray

"Tristand" pipe vise made with a built in folding tool tray to eliminate all loose parts. . . . The tray pushes down flat for extra rigidity of the vise stand. The newly designed full-size base overhangs the front legs to give clearance for threader handles. It is equipped with three pipe benders, ceiling brace screw, pipe rest and tool hanging slots. The feet have rubber grommets to prevent travel in use. Capacity is 1/8 to 2 1/2 in.

Manufacturer—The Ridge Tool Co., Clark St., Elyria, Ohio.





Above: Tool Tray

Right: Purifier

Purifier for Air Tools

Purifier developed for keeping moisture and dirt out of air tools and other pneumatic equipment. . . . Called the "Type LC Hi-eF," this unit is designed to remove dirt and moisture by means of a combination centrifugal and baffle type separating element inside a forged steel body, thus eliminating the need for filters. As a result, the manufacturer claims that once the unit is installed on the air line near the pneumatic equipment, there is no necessity for periodically cleaning the unit. Liquids and solids are drained automatically from the purifier by a float trap. It is made in a wide range of sizes for installation in any size piping when used in a vertical position, and in 1 in. through 2 in. sizes when installed horizontally.

Manufacturer — The V. D. Anderson Co., Dept. LC, 1935 W. 96th St., Cleveland 2, Ohio.

Controlled Volume Pump

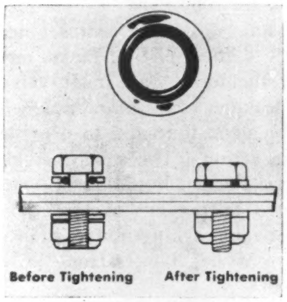
Motor driven controlled volume pump for use in proportional feed systems . . . . A mechanical, single revolution clutch arrangement permits one stroke of the pump in response to an electrical signal to effect feed of an additive in proportion to main line flow rate. This signal may be transmitted by a timer, electrical contacts on a positive displacement meter, etc. The pumps have a capacity from one pint to 1350 gph, against discharge pressure up to 50,000 psi.

Manufacturer—Milton Roy Co., Station Q, 1300 E. Mermaid Lane, Philadelphia 18, Pa.

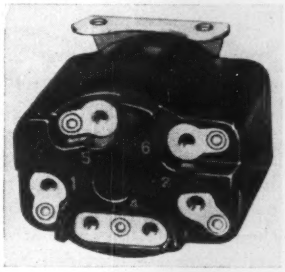
One Piece "O" Ring and Washer

One piece washer and rubber "O" ring combination with the ring permanently bonded to the washer . . . . Called "Duo-Seals," they are available in 3/16 in. to ⅝ in. nominal bolt diameter sizes. According to the manufacturer, they provide leakproof sealing against fluids, gases or air around bolts where they go through walls, bulkheads or skins retaining such fluids or gases. The seals are color coded according to use. The company states that slippage of the "O" ring is eliminated during and after installation because when the bolt is tightened the original round contour of the ring becomes square under compression.

Manufacturer—Rubber Teck, Inc., 19115 S. Hamilton St., Gardena, Calif.



"O" Ring



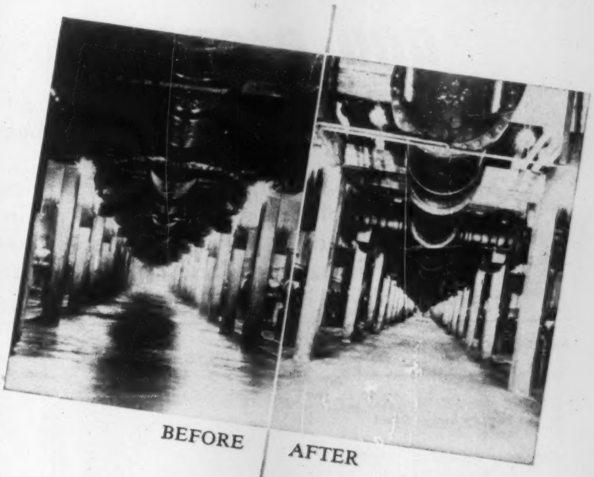
Relay

Capacitor Motor Starting Relays

Potential motor starting relays, "Type 91255", used to start single phase capacitor type motors where it is impractical or impossible to use a centrifugal switch as in hermetically sealed refrigeration and air conditioning motors. . . . The relays are totally enclosed

how

pipe galleries stay dry



surrounded by cold water

The pipe galleries in Chicago's water filtration plant are surrounded by Lake Michigan water, as cold as 40° F. Before Kathabar, condensation literally created a fog in the galleries, corroded expensive equipment, rotted wiring, peeled off paint.

Moisture removal by refrigeration was impractical under the conditions prevailing. Kathabar dehumidifying units completely dried up the galleries by lowering the dew point of the air. Eliminating the condensation damage, the Kathabar units pay for themselves in less than 3 years.

This is one of the many contributions of Kathabar humidity engineering. It is used for the packaging, processing, storage, and testing of many products. By preventing frost, condensation, corrosion, and supplying direct dehumidification, Kathabar saves money and improves product quality.

Wherever atmospheric moisture is a problem, Kathabar engineers will be glad to help you find a cost-saving solution.

Write for literature
Group K-53-4.

Kathabar
HUMIDITY CONDITIONING

SURFACE COMBUSTION CORP., TOLEDO 1, OHIO
ALSO MAKERS OF
Surface INDUSTRIAL FURNACES · Janitrol AUTOMATIC SPACE HEATING

The LEADERS!

AIR DISTRIBUTION

CARNES

in style, quality and economy

Yes, Carnes leads with a line of diffusers that's way ahead! The best ideas and newest developments . . . beautiful styling . . . easy installation . . . complete adjustability are all incorporated to bring you top quality at low prices. Your best bet is Carnes!

A DIFFUSER FOR EVERY REQUIREMENT

MODEL		NECK SIZES	CFM OUTPUT
E-1	Supply only fixed cone	5 to 32	50 to 13,400
E	Supply only fixed cone	5 to 32	50 to 13,400
EJ	Supply only adjustable cone		
ER	Supply and return fixed cone		
BR	Supply only adjustable cones	6 to 32	115 to 13,400
BRS	Supply and return adjustable cones		
EH	Half Round Supply only fixed cone	6 to 20	50 to 2,725
QSL	Combination diffuser and lighting fixture adjustable	8 to 17	210 to 2,670
SFS	Supply only surface type fixed cone	8 x 8 to 20 x 20	150 to 6,925
SFR	Supply only recessed type fixed cone		

CARNES

Write today for Carnes descriptive literature, selection charts and engineering data!

The Most Talked About Name in Air Distribution

W. R. CARNES CO., VERONA, WISCONSIN

and a snap action mechanism is designed to assure positive contact action under normal operation. Relays may be mounted in any position and have accessible wiring terminals to reduce wiring time on an assembly line. They are available with extra single and double dummy terminals. A normally open contact can be added at the factory for sequence starting of dual motor air conditioners.

Manufacturer—R-B-M Div., Essex Wire Corp., Logansport, Ind.

Lightweight Gas Fired Unit Heater

Gas fired unit heater which weighs 31 lb and has a capacity of 25,000 Btu per hr input. . . . The manufacturer says that it delivers 337 cfm at a velocity of 515 fpm, giving it a heat throw of 28 ft and an 8 ft mounting height. According to the maker, the light weight of "Model U-25" is achieved through the use of a stainless steel burner and heat exchanger and the direct firing of the heat exchanger tubes, which permits the elimination of a combustion chamber. The unit is AGA approved for use with natural, mixed, manufactured, LP and LP-air gases, it is stated.

Manufacturer —Modine Mfg. Co., 1509 De Koven Ave., Racine, Wis.

Tank Thermostat Valve

Tank thermostat valve for temperature control on small storage tanks, kettles, plating tanks, etc. . . . . The company states that the metal ball inner valve seats tightly to prevent steam leakage. Since the hardened steel ball is not attached to the stem, it rotates to provide good seating and self cleaning action. The steam actuating bellow is a one-piece metal design, liquid filled. An override spring is incorporated to prevent overstressing the thermostatic system at over-range temperatures. Standard valves are provided in five 50 deg ranges from 25 to 275 F, in sizes from ⅜ to 1 in.

Manufacturer—Klipfel Valves, 1075 Lincoln Ave., Hamilton, Ohio.

Electric Steam Generator

Electric steam generator said to be capable of building 100 lb of live steam pressure at 320 F in five min, with only two moving parts. . . . The "Electro-Steam Generator" features automatic safety controls. According to the manufacturer, the generator eliminates the need of a flue, fuel tank and fuel line. Installation requires a 220 volt outlet and water connection. Valve adjustments are made to deliver steam and hot water as needed. Nearly 100 percent of heat input is achieved with three completely immersed heating units, the company states. Accessories are available so that the unit can be adapted for steam cleaning purposes. Installation of the unit may be either portable or permanent.

Manufacturer — Dryomatic Corp., 812 N. Fairfax St., P.O. Box 334, Alexandria, Va.

EQUIPMENT BRIEFS . . .

THERMOSTATS for mobile air conditioners now are available . . . . In the future, mobile air conditioners may be ordered from the factory with thermostats already installed. Thermostats in kit form may be ordered so that dealers can make their own installations.

Manufacturer—Union Asbestos & Rubber Co., Heating and Cooling Div., 332 S. Michigan Ave., Chicago.

CIRCULAR SLIDE RULE 8 in. in diameter, made of vinylite plastic . . . . The instrument is equivalent to a straight type slide rule over 20 in. in length. It performs the functions of multiplication, division, proportions, finding squares or square roots, cubes or cube roots, reciprocals and logarithms.

Manufacturer—Allegheny Plastic, Inc., 35 Thorn Run Rd., Coraopolis, Pa.

PUMP KITS for converting 11 of the manufacturer's pump models into gas engine portable pump units . . . . The kit includes the desired pump model with hollow steel shaft, base plate for the engine, fold down carrying handle, torque arm and all necessary bolts and nuts, with instructions on the unit's assembly and use. The assembly handles a wide range of liquids on booster pumping or transfer duty.

Manufacturer—Hypro Engineering, Inc., Dept. KP, 404 N. Washington Ave., Minneapolis 1, Minn.

VENT CAPS, FILL BOXES and FILL CAPS in additional sizes have been added to the manufacturer's line. . . . The line has been expanded to include a wider selection of sizes and construction materials.

Manufacturer—Oil Equipment Mfg. Co., 169 Derby Ave., New Haven, Conn.

COUPLING for AIR SYSTEMS, the "1800 Series" pneumatic coupling and connector . . . . It incorporates the firm's "Quick-Lock" principle designed to provide fast interchange of tools and locking to prevent uncoupling. The coupling and connector are machined from bar steel, cadmium plated.

Manufacturer—Roylyn Inc., 1706 Standard Ave., Glendale 1, Calif.

Here's What You've Been Looking for!

POWER ROOF VENTILATOR

CARNES

(Above Style Available in sizes up to 24")

You'll find everything you want with Carnes Power Roof Ventilators. Available for all types of commercial and industrial installations in a large range of size — duct sizes from 4" to 24" and capacities from 100 CFM to 17,600 CFM. Plus — quiet operation; easy installation; exhaust without back draft; and longer service.

. . . this all-aluminum power roof ventilator with the famous CARNES "know-how"

LOW SILHOUETTE — for a neat installation that will not extend above the normal roof parapet.

AVAILABLE NOW — Shipment of all sizes and types of ventilators can be made without delay.

COMPETITIVELY LOW-PRICED — You'll be amazed at the price of Carnes Roof Ventilators. Prices are in line with ordinary ventilators.

NON-SPARKING ALUMINUM FAN WHEELS — This important safety feature is standard equipment. Available in both backwardly inclined centrifugal fan wheels and axial flow fans.

ALL-ALUMINUM CONSTRUCTION — For years and years of dependable non-rusting service and highest quality appearance.

CARNES

The Most Talked About Name in Air Distribution

W. R. CARNES CO. **VERONA, WISCONSIN**

No need to improvise or compromise when you specify

AGITAIR

Only AGITAIR square and rectangular air diffusers are custom-made to suit conditions of each application. The patented, built-in diffusing vanes are scientifically arranged in various louver patterns which provide blows in 1, 2, 3 or 4 directions without use of blank-offs. This feature eliminates the necessity of "oversizing" to compensate for blank-offs or baffles.

When you specify AGITAIR square and rectangular diffusers you can be sure of 100% draftless air distribution from any ceiling or sidewall location. What's more, these smart, modern units are now available with or without removable, interchangeable cores. Whatever the space condition, there's an AGITAIR custom-made to give perfect performance and complete satisfaction.

New 34-page Type R Catalog reveals how correct air distribution is simplified by AGITAIR. Contact your local AGITAIR representative, or write us direct for your free copy.

AGITAIR®
SQUARE AND RECTANGULAR AIR DIFFUSERS

AIR DEVICES INC.
185 Madison Avenue, New York 16, N. Y.

AIR DIFFUSERS · FILTERS · EXHAUSTERS

RECENT TRADE LITERATURE..

Air Conditioners, Evaporative Coolers

Bulletin RE-154 covers refrigerated air conditioners, self contained units with evaporative condensers built in, with capacities of 10, 15, 20, 25 and 30 tons. Bulletin DM-154 covers air washer type evaporative coolers in capacities from 4000 cfm through 12,000 cfm for industrial and commercial cooling applications. The bulletins contain specifications and performance curves.

Manufacturers—Alton Mfg. Co., 1112 Ross Ave., Dallas 2.

Centrifugal Pump

Bulletin 1001B contains design features and specification data on the "GS" (general service) centrifugal pump. Maintenance and service features are illustrated, including the rotor assembly which contains all working parts and which lifts out of the casing as a single unit. A full page cutaway diagram is included.

Manufacturer—De Laval Steam Turbine Co., Trenton 2, N. J.

Coating for Process Equipment

Four page booklet reports on the properties, uses and application methods of "Type T" mastic coating. This is a rustproofing, corrosion resistant mastic coating for the exteriors of tanks, vats, ducts and structural work of chemical process plants. Photographs illustrate how it protects against acid and alkaline fumes, high humidity and salt air. A chemical characteristic chart indicates the degree of resistance shown by the coating to many corrosive reagents employed by industrial concerns.

Manufacturer—Palladium Mastic Corp. of America, Field Service Div., 328 Union Ave., Rutherford, N. J.

Controlled Volume Pump Manual

Technical Paper 63 deals with the installation and maintenance of controlled volume pumps. Under separate headings the manual describes correct procedure for connection of suction piping and discharge piping, flushing connections, breaking in packing, etc. Other sections include preventive maintenance, replacing packing, checking the pump in operation, and recommended spare parts. A special chart lists common difficulties encountered and describes causes and remedies.

Manufacturer—Milton Roy Co., Station R, 1300 E. Mermaid Lane, Philadelphia 18.

Convoluted Expansion Couplings

Catalog 55 describes convoluted couplings, a new addition to the company's line of industrial expansion joints. Designed and engineered to meet industrial needs for low pressure and vacuum service joints, the "Sola-Flex" couplings embody a convolution contour design to give a low spring rate. The publication includes engineering data, with spring rates, deflection forces and dimensions. Ten pages of tables give data on each size and type, along with dimensional diagrams and formulas for calculating various movements of couplings.

Manufacturer—Solar Aircraft Co., 2200 Pacific Highway, San Diego 12, Calif.

RECENT TRADE LITERATURE

Continued

Duct Blower

Data sheet illustrates and describes the operation of "Universal" duct blowers and various applications for heating, cooling and ventilating. According to the manufacturer, the blowers can be mounted in any position because of the cushion suspension of the blower assembly on a center of gravity. Included in the data sheet are a schematic drawing, tables of dimensions and specifications, and two air selector tables for heating and cooling.

Manufacturer—Viking Air Conditioning Div., National Radiator Co., 5601 Walworth Ave., Cleveland 2.

Flow Meters

Catalog 2320 describes the company's complete line of flow meters. It includes indicating, recording, integrating and controlling instruments of both evenly graduated and square root types, as well as area meters and differential converters. Also included is a section on flow approximations and installation information.

Manufacturer—Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne and Windrim Aves., Station 64, Philadelphia 44.

Gas Fired, Warm Air Unit Heaters

Bulletin 543-B illustrates a line of commercial and industrial gas fired, warm air unit heaters having output capacities of 88,000 to 160,000 Btu per hr. The four page folder describes the two types; one for suspended mounting and one that can be built into duct type heating or air conditioning systems. Also included are tables listing heating and air delivery capacities, outlet temperatures, air pressure drops, weights and dimensions of the different units.

Manufacturer—Dravo Corp., Heating Dept., Dravo Bldg., Fifth and Liberty Ave., Pittsburgh 22.

Gas Regulators

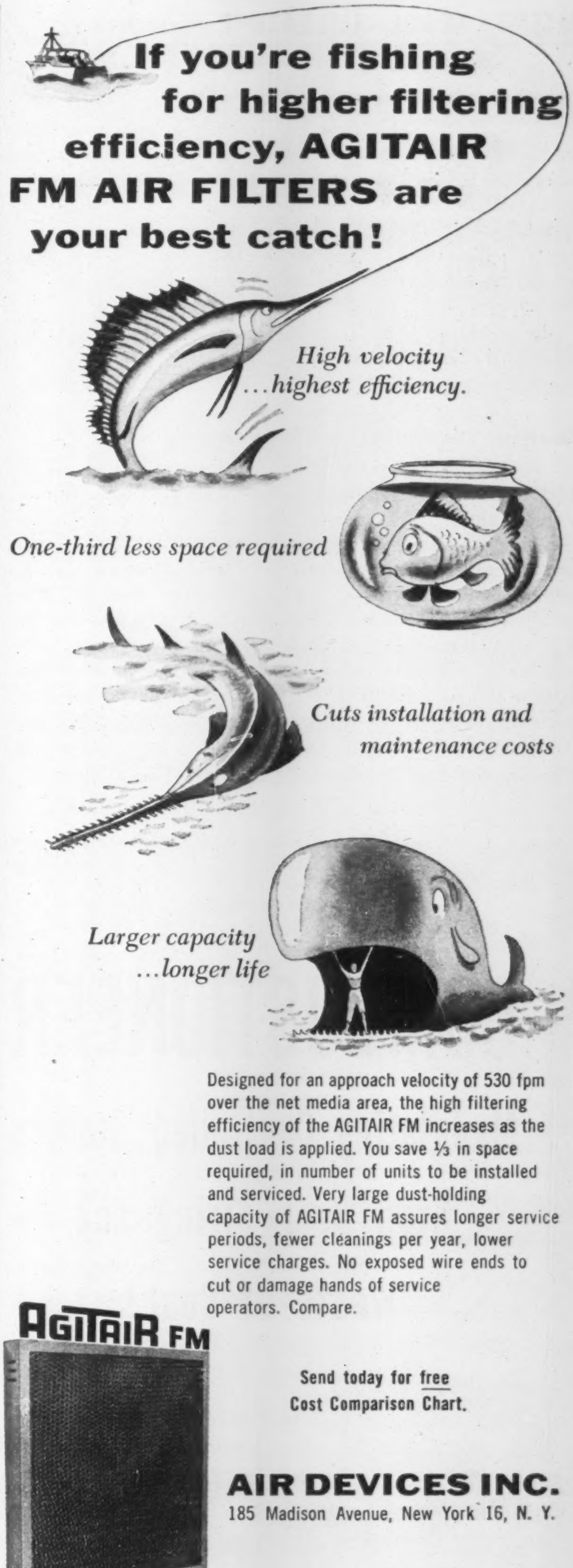
The company's complete line of gas regulators is described in Catalog 806. Cylinder, manifold and pipeline regulators are illustrated with complete descriptions covering specifications and operating data. Each regulator has a chart showing types of gages used with it, inlet and outlet connections, maximum flow and maximum working pressure. Also included are flow and pressure charts indicating at what point the regulators can be used to perform a particular job. The catalog is cross indexed so that a particular regulator may be located by its uses and by its gas service.

Manufacturer—Air Reduction Sales Co., 60 E. 42nd St., New York 17.

Heat Control System

Four page color brochure describes recent developments and refinements in the company's "B-60" heat control system. The booklet illustrates the latest in the company's snap-action and mercury switch thermostats, gas control valves and pilot generators.

Manufacturer—General Controls Co., 801 Allen Ave., Glendale, Calif.


If you're fishing for higher filtering efficiency, AGITAIR FM AIR FILTERS are your best catch!
High velocity ...highest efficiency.
One-third less space required
Cuts installation and maintenance costs
Larger capacity ...longer life
AGITAIR FM

Designed for an approach velocity of 530 fpm over the net media area, the high filtering efficiency of the AGITAIR FM increases as the dust load is applied. You save ⅓ in space required, in number of units to be installed and serviced. Very large dust-holding capacity of AGITAIR FM assures longer service periods, fewer cleanings per year, lower service charges. No exposed wire ends to cut or damage hands of service operators. Compare.

Send today for free
Cost Comparison Chart.

AIR DEVICES INC.
185 Madison Avenue, New York 16, N. Y.

FILTERS • AIR DIFFUSERS • EXHAUSTERS

RECENT TRADE LITERATURE *Continued*

Heat Transfer Equipment

This firm has recently issued a booklet on its Heat Exchanger Div. It is intended to acquaint petroleum refining, power generation and chemical processing industries with the work that has been done in designing, engineering and fabricating heat transfer equipment. Illustrated and described are the step by step operations required in the manufacture of equipment of this type.

Manufacturer—The Lummus Co., 385 Madison Ave., New York 17.

Heating, Ventilating, Air Conditioning

Catalog 1620 on commercial and industrial heating and ventilating units and Catalog 1630 on air conditioning units now are available. Each is divided into five separate data sections: descriptive, performance, layout, engineering and service. Heating and ventilating units are covered with air volumes ranging from 1200 cfm to 23,000 cfm; heating capacities from 100,000 Btu to 2,500,000 Btu. Air conditioning units range from 1200 cfm to 21,000 cfm air volume; cooling capacity from 20,000 Btu to 2,000,000 Btu. Selection data, specifications and maintenance instructions are included.

Manufacturer—Westinghouse Electric Corp., Sturtevant Div., Dept. T-126, 200 Readville St., Hyde Park, Boston 36.

Humidity Conditioning Problems

A new issue of *The Humidity Engineer* is devoted to industrial humidity conditioning problems. One article describes the air conditioning system used by a boxboard manufacturing firm to maintain standard atmospheric conditions in its testing laboratory. A second discusses factors such as worker morale, health and efficiency, which justify industrial air conditioning. This issue also discusses the application of humidity conditioning to "mothballing" factories, drying compressed air, wind tunnel air moisture control and to making safety glass.

Copies may be obtained by writing to the editor of the magazine, Surface Combustion Corp., 2375 Dorr St., Toledo 1, Ohio.

Lining for Hot Water Tanks

Bulletin describes "Plasticote," an insoluble cement lining designed to protect the inside of both new and old hot water tanks and generators against corrosion, and to eliminate rusty water. Applications and advantages are described.

Manufacturer—Metalweld, Inc., Scotts Lane & Abbottsford Ave., Philadelphia 29.

Liquid Filters

Bulletin WC-115 describes the use of diatomite filters for filtration of water or other liquids for industrial use. Text, photographs and schematic diagrams show typical arrangements of the filters and explain how the liquid to be treated is passed through a filtering

COMBUSTIONEER

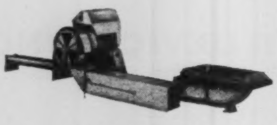
Modulating Controlled Stokers Stop Over-Firing and Waste of Coal!

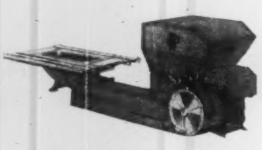
• Combustioneer's Modulating Controls automatically feed coal and air to the fire at *variable* rates, to meet load requirements, starting slowly, accelerating, tapering off, or stopping. This levels off peaks and valleys in feeding, prevents over-firing and waste of coal! Furthermore, Combustioneer's agitating transmission keeps the fire-bed always open, free burning . . . the automatic respirator controls air delivery for maximum combustion efficiency, and smoke-free stacks. The result . . . heat output is always balanced with the load demand.

Combustioneer Hopper and Bin-Feed Models range in capacity from 9 to 1000 lbs. per hour. They are precision made, rugged, giving long life in hard service.

Write today for your copy of Architects Heating Manual containing complete Combustioneer data and specifications.

Combustioneer Division
The Steel Products Engineering Company
1362 W. Columbia St., Springfield, Ohio


Bin Feed Model No. 15


Hopper Model No. 50

Combustioneer

Gas Burners • High and Low Pressure Oil Burners
Oil Furnaces • Stokers • Humidifiers

medium consisting of a form of silica known as diatomaceous earth. The filters are used to remove oil from boiler feedwater and condensate, to clarify moderately turbid process water, and to purify drinking water.

Manufacturer—Graver Water Conditioning Co., 216 W. 14th St., New York 11.

Maintenance Problems

Bulletin TIS 2090 describes in case history form, maintenance problems and their solutions. One deals with the joining and repair of small diameter copper pipes with the firm's paste solder, "Eutec-Tin-Weld".

Manufacturer—Eutectic Welding Alloys Corp., 40-40 172 St., Flushing 58, N.Y.

Oxygen Piping in Hospitals

How to Install Oxygen and Nitrous Oxide Piping Systems in Hospitals has been prepared for the guidance of piping contractors installing such systems. The booklet has two sections. One gives illustrated step by step instructions for making the silver brazed joints required for this type of piping system. The second section gives specifications for installing and testing lines in accordance with NFPA standards.

Published by—National Cylinder Gas Co., Medical Div., 840 N. Michigan Ave., Chicago 11.

Packaged Steam Generators

Bulletin MH 3-54 gives detailed coverage on "Type MH" packaged water tube steam generators which are furnished for oil or gas firing or both, with automatic, semi-automatic or manual combustion controls. Included are cutaway illustrations, installation photos, tube arrangement layouts, a photo sequence story of actual shop assembly construction, auxiliary equipment available and a dimension table for 13 standard sizes ranging in capacity from 10,000 to 40,000 lb of steam per hr.

Manufacturer—Union Iron Works, 1500 Cascade St., Erie, Pa.

Pressure Loss Calculator for Steam Valves

A new slide chart calculator that estimates pressure drop and indicates the proper size steam valve needed for any pressures up to 1500 psi now is being distributed. Printed on this calculator are full operating instructions and necessary technical data.

Available from—Golden-Anderson Valve Specialty Co., 1210 Ridge Ave., Pittsburgh 33.

Safeguards for Idle Equipment

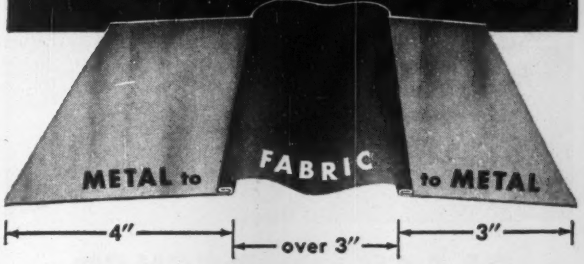
Laying-Up Equipment is a six page folder which suggests various methods used for protecting steam boilers, turbines or other water-using equipment during shutdowns. The publisher is a consultant on industrial, municipal, utility and marine water fields.

Published by—Hall Laboratories, Hagan Bldg., Pittsburgh 30.

Safety Data for Welders and Cutters

New 32 page booklet, *Safety*, is specifically designed for welding and cutting operators handling

NEW! DURO
METAL-FAB
makes quality flexible ducts up to 70% faster than old methods

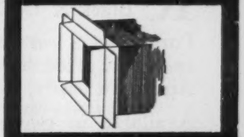


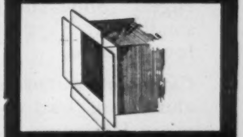
pre-assembled for you metal to fabric to metal!

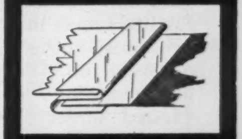
ONE-PIECE FABRIC AND METAL DUCT CONNECTOR

- For your protection, exclusive "Double-Loc" metal-to-fabric seam
- Fastest, simplest money-saving way to fabricate flexible duct connectors
- Wide metal edges ample to form all types of joints (clinch, flange, slip, etc.)
- Finest engineer-approved materials used throughout
- Required flat lengths quickly pulled from Dispens-o-Flat carton. (Packed in 100 ft. rolls)
- Stops vibration noise in furnaces • blowers • air conditioners • attic fans, etc.
- Duro Stapler eliminates costly sewing of fabric
- Available in U.L. approved Canvas, Asbestos, Neoprened Fiberglas

Typical types of connector made with DURO METAL-FAB


CLINCH COLLAR


FLANGE


SLIP

PAT. PEND.
UNION
MADE

Write for DURO METAL-FAB Samples and Literature.

DURO-DYNE CORPORATION
800D Third Ave., New Hyde Park, L. I., N.Y.

BLACK & DECKER PORTO-SHEARS* Cut Job-Time 75%

REAL time-, trouble-, and labor-savers . . . Black & Decker Porto-Shears.

Porto-Shears *cut many times faster than hand snips* . . . often cut where snips won't cut at all. And do it easily, cut muscular strain.

Available in two sizes (16 and 12 gauge capacities) Porto-Shears *give excellent results.* Cutting action eliminates burrs and ragged edges. Shoe construction permits cutting to small radii. Visible blade makes it easy to follow patterns.

Cut many materials . . . steels, Monel, copper, aluminum, lead . . . thin plastic sheets and wood laminates.

Like all B&D Tools, Porto-Shears are made with husky housing, precision parts and powerful B&D-built motor. As a result Porto-Shears give outstanding service . . . save time, cut costs on every job. Price: $95.00 and $135.00. See demonstration at your B&D Distributor. (Listed under "TOOLS-Electric in classified telephone directory".) Also, send for Catalog No. 10. Address: THE BLACK & DECKER MFG. CO., 640 Pennsylvania Ave., Towson 4, Md.

*Reg. U.S. Pat. Off.

LEADING DISTRIBUTORS EVERYWHERE SELL

B&D Black & Decker

PORTABLE ELECTRIC TOOLS

oxyacetylene and arc welding equipment. It details safety cautions and rules for personal safety, the handling and maintenance of cylinders, torches, regulators and hoses. It discusses safe practices in setting up, adjusting, using and shutting down equipment. Sketches show safe practices and some malpractices in the welding and cutting field.

Manufacturer—Air Reduction Sales Co., 60 E. 42nd St., New York 17.

Spiral Wound Gaskets

Bulletin No. AG-953 describes "Ajax" spiral wound gaskets for pipe flanges; boiler manholes, handholes and tube caps; water walls and other boiler accessories; and special processing vessels. Shown are types for raised face, smooth face, Crane-lap and Van Stone joints, flange unions, male and female joints, tongue and groove fittings, and all standard makes of boilers and accessories. Flange gasket and boiler gasket dimension tables and bolting data are included.

Manufacturer—United States Gasket Co., 602 N. 10th St., Camden 1, N. J.

Squirrel Cage Motor Selector

Bulletin B-2102, *Motor Selector,* is designed to aid in choosing squirrel cage induction motors for applications ranging from 1 to 200 hp. The bulletin lists performance characteristics, construction features, dimensions, price and other information for ordering.

Manufacturer—Reliance Electric and Engineering Co., 1076 Ivanhoe Rd., Cleveland 10.

Steam Flow Metering

Reprints of an article, *Dual Ranging Shuntflo Meters by Means of "Squires" Pressure Reducing Valves,* now are available. It is a progress report on a means for increasing the accuracy of steam flow metering where the flow rate varies and may be below 10 percent of the maximum rate. The reprint describes the system used to obtain accuracies of 2 percent over a wide range and variable steam use load.

Manufacturer—Builders-Providence, Inc., 345 Harris Ave., Providence, R. I.

Steam Trap Problems

The manufacturer has revised its 36 page catalog, *Solving Steam Trap Problems,* to include information on new combination float and thermostatic traps. In addition, the catalog contains specifications and capacities on steam traps, float traps, air release valves and pipe line strainers. It tells how to calculate condensation loads and select traps for all classes of equipment, including unit heaters, jacketed kettles, autoclaves, submerged surfaces, steam mains and header drips. Pointers are given on how to install and service traps.

Manufacturer—V. D. Anderson Co., 1935 W. 96th St., Cleveland 2.

Steel Use in Chemical Industries

Second edition of the booklet, *Allegheny Metal in Chemical Processing,* covers the use of stainless

RECENT TRADE LITERATURE

Continued

steel in the manufacture of acids and other chemicals, in the general process industries, in the plastics industry, in pharmaceutical manufacture, in dye making and in soap making. Also included are corrosion resistance data, fabricating information, and a stainless steel finder.

Manufacturer—Allegheny Ludlum Steel Corp., 2020 Oliver Bldg., Pittsburgh 19, Pa.

Tubular Electric Heaters

Bulletin on tubular electric heaters for industrial services illustrates and describes the component parts of the heaters including the pipe, resistors, insulators, strap and terminal box. Applications listed include heating heavy oils and other viscous liquids in tanks and pipe lines; melting ice on water gates at dams; explosionproof convection heating, etc. Also explained in the bulletin are the characteristics of electric heating and operating comparisons with steam for these services.

Manufacturer—Turbine Equipment Co., Hynes Electric Heating Div., P.O. Box 578, Westfield, N.J.

Unit Coolers for Small Spaces

Bulletin No. 105-53 covers "V2" unit coolers, designed specifically for use in confined spaces. The bulletin includes engineering drawings and photographs, describes construction features and gives engineering details. It explains how the V-arranged coils enable two-directional air circulation and how air is circulated away from doors. Complete dimensions are tabulated and keyed to engineering drawings. A second table gives application data and information on cooling capacity, air circulation and connection requirements.

Manufacturer—Tenney Engineering, Inc., 1090 Springfield Rd., Union, N. J.

Water Conditioning and Waste Treatment

New bulletin describes three-stage reactors for softening or clarifying surface waters for process, industrial or municipal applications and for the treatment of industrial waste water for re-use or for the reduction of stream pollution. Other uses listed include lime or lime-soda softening of hard water for municipal, industrial and process applications, dealkalization and coagulation of surface water as a pre-treatment to ion exchange or hot process softeners, or removal of silica from the water by adsorption with ferric hydroxide magnesium oxide or other hydroxides in the sludge.

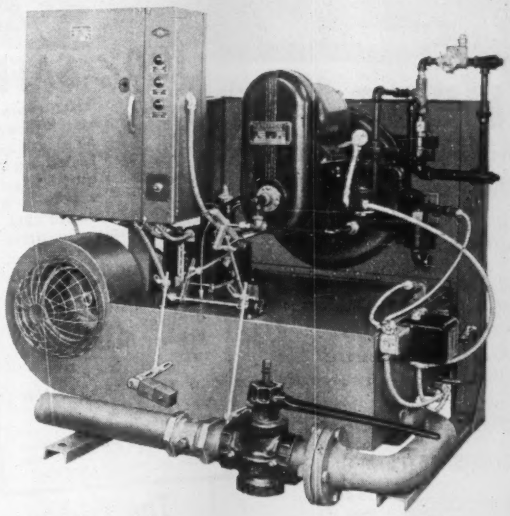
Manufacturer—American Water Softener Co., Lehigh Ave. and 4th St., Philadelphia 33.

Year 'Round Air Conditioner

Bulletin No. C-4.23 describes "Spotaire" year 'round air conditioning system for hotels, motels and apartments. This system utilizes individually controlled room blower units with the cooling-heating unit located remotely. Hot or cold water is piped through finned coils in the blower units. The bulletin shows an actual installation and contains a table giving construction and performance data.

Manufacturer—Drayer-Hanson, Inc., 3301 Medford St., Los Angeles 63.

WEBSTER
ROTONETIC*



DUAL FUEL FIRING
BURNER

- √ Sizes from 75 to 300 horsepower.
- √ Minimum gas pressure requirements.
- √ Low installation costs.
- √ Maximum efficiencies on BOTH gas and oil.
- √ Minimum base height requirements.
- √ Utilizes all grades of fuel oil.
- √ Extremely low noise level.
- √ Approved electronic combustion safeguard system.
- √ Simpler changeover than ever before.
- √ One hundred per cent forced draft.
- √ Completely assembled, piped, wired and tested.

These and many other outstanding features combine to provide the same dependable high quality performance as the WEBSTER DYNETIC gas burner. Neither fuel must suffer if the WEBSTER ROTONETIC is used. With integral pumps, integral oil preheaters for heavy oils, patented oil burner "flame-shaping" vanes, and full modulating or optional high-low control, the WEBSTER ROTONETIC is designed to provide long lasting customer satisfaction the year around.

It is furnished with a precast refractory front as an integral part of the burner assembly. The installer need only finish the furnace wall on each side and above the burner.

Listed by Underwriters' Laboratories, Inc.

*TRADEMARK *Write for Literature*

The WEBSTER ENGINEERING COMPANY
TULSA, OKLAHOMA
Division of SURFACE COMBUSTION CORPORATION, Toledo, Ohio

ONLY ELECTROMODE ALL ELECTRIC HEATERS have all 3

Triple Assurance With . . .

HEAT

Where You Need It!

- HARD-TO-HEAT AREAS
- REMOTE LOCATIONS
- PROBLEM INSTALLATIONS

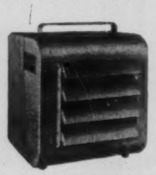
- *Quick, easy to install*
- *Minimum maintenance*
- *100% efficient*
- *Automatic control*
- *Clean, fan-circulated heat*
- *User Satisfaction*

SUSPENSION TYPE MODELS

10,000 to 45,000 watts. For complete or auxiliary heat in large areas. Adjustable louvers for directing heat where desired.

Model 14-10

COMBINATION PORTABLE



and Suspension Type Models. 1500 to 7500 watts. Plug in temporarily or mount on swivel brackets. Adjustable louvers.

Model AN-30A

FOR HOMES - OFFICES - MOTELS STORES ETC.

Electromode Wall-Type Heater has built-in thermostat for individual room temperature control. Fan-circulated heat is distributed by down-flo principle. 1500 to 4000 watt capacities.

Model WA

100% SAFE

Hot resistor wires are insulated and embedded within a finned aluminum casting, assuring positive protection from fire, shock or burn. This finned type element acts as a superior heat diffuser, resulting in greater heating economy.

5 YEAR GUARANTEE

The patented, cast-aluminum heating element is guaranteed for five years against all defects of material or workmanship.

The Famous GE UNIT MOTOR

Totally enclosed construction protects motor from entry of dust. Large supply of oil sufficient for years of motor operation is factory-sealed-in. Forced lubrication system assures long life and quiet operation.

SAFETY SWITCH

Built into every Electromode Heater is a small thermal safety switch, located on or near the heating element. If for any reason the air flow should stop, causing overheating of the element, this safety switch automatically shuts off the current.

Approved by Underwriters' Laboratories

ELECTROMODE CORPORATION

45 CROUCH ST., DEPT. HP-64 ROCHESTER 3, N. Y.

Please send free literature on:

Electromode Heaters ☐ Domestic ☐ Industrial

NAME

ADDRESS

CITY ZONE STATE

WE HEAR THAT . . .

The Wheelabrator Foundation, Inc., sponsored by *AMERICAN WHEELABRATOR & EQUIPMENT CORP.*, is setting up a plan to award college scholarships annually to male employees of the company and sons of employees. The scholarships are to be known as the Verne E. Minich founder scholarship to Purdue University, and the Otto A. Pfaff scholarship to the University of Notre Dame. Mr. Pfaff is general manager and president of the firm.

ROBERTSHAW-FULTON CONTROLS CO. is expanding its production facilities with the opening of a new plant at Indiana, Pa. The company has taken a five-year lease on the plant constructed for it by the Industrial Development Corp. of Indiana. *W. D. MILLER*, assistant vice president of Robertshaw-Fulton and now general manager of the Robertshaw Thermostat Div., will be in charge of the new plant.

The *BABCOCK & WILCOX CO.* has signed an agreement with the Atomic Energy Commission to engage in studies related to the equipment aspects of nuclear power development. Terms of the agreement point out that the company "will make a survey and study of the commission's reactor development activities and determine the engineering, technical and economic aspects of practical applications of atomic power."

Thirty-six sales and engineering representatives from all parts of the United States recently attended a three-day conference of the *BRUNER CORP.* in Milwaukee. Primary purpose of the conference was to introduce several new models of the company's water softening equipment.

DELTA HEATING CORP.'s new oil fired unit heaters have been installed on two-wheel trailers for mobile demonstration to dealers, distributors and commercial users. The demonstrators left Philadelphia at the close of the OHI show last month for a tour through the United States and Canada.

A series of 34 refrigeration and air conditioning meetings were recently held by the *DETROIT CONTROLS CORP.* on the east coast. Purpose of the sessions was to acquaint retailers, wholesalers, shop service personnel and automobile dealers with new mobile air conditioning equipment. A demonstration instrument panel showed the wide variation of operating conditions encountered.

A completely revised text, *Refrigeration Auxiliaries*, has been added to the curriculum of the *INTERNATIONAL CORRESPONDENCE SCHOOLS.* Written by *C. T. BAKER*, air conditioning designer and consulting refrigeration engineer, the 116 page text is included in the refrigeration and air conditioning courses offered by the school.

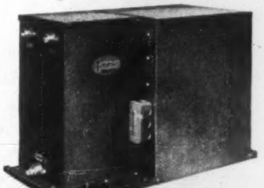
TENNEY ENGINEERING, INC., formally opened its new plant at 1090 Springfield Rd., Union, N.J., with an

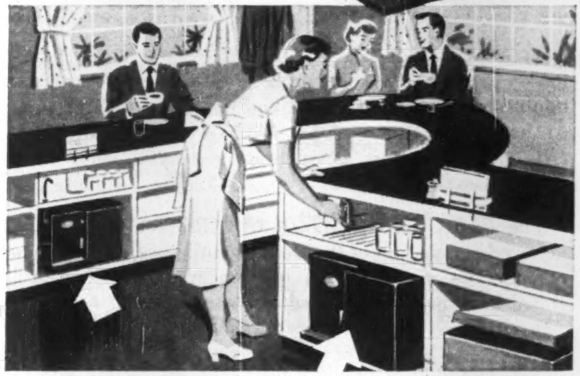
Cool Water

. . . wherever you need it
with the low cost . . .

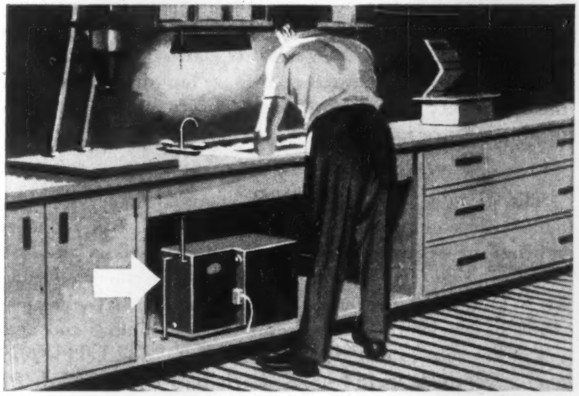
TEMPRITE

REMOTE WATER COOLER





REDUCE WASTED STEPS and wasted motion! Place Temprite "remote" water coolers in any number of the most convenient locations in your restaurant or cafeteria, *for peak serving efficiency!* Very economical! Quickly and easily installed! *No major overhauling, no costly piping!*



THE VERSATILE TEMPRITE is ideal for many water and other liquid cooling tasks, such as lab experimental work, for photo print developing, etc. *Accurate, easily adjusted temperature!* Compressor, condenser, cooler and wiring enclosed in a metal cabinet. *Approved by Underwriters'.*

TEMPRITE
Since 1929

Distribution Franchises available. Write for details now!

TEMPRITE PRODUCTS CORP.
P. O. BOX 72-L, E. MAPLE ROAD
Birmingham, Michigan
Originators of Instantaneous Liquid Cooling Devices

For all-around utility... the BEST BUY is Ramset

FASTENING SYSTEM

SUPER-POWER JOBMASTER
for heavy-duty work
Operating length 15" Weight 7⅞ lbs.

Ramset Fasteners
Ramset Fasteners
3/8"
Fasteners
1/4" OR 3/8"
Fasteners

TWO TOOLS IN ONE
JOBMASTER and
PLUS-POWER
JOBMASTER
Length 12"
Weight 6¾ lbs.

For your light-duty anchoring work into steel or concrete, requiring ¼" fasteners, the Ramset Jobmaster can't be matched for speed, ease, economy and wide versatility.

If ⅜" fasteners are called for, you can have a Plus-Power Jobmaster, or attach a ⅜" assembly to your standard Jobmaster. You can interchange from one to the other in a few moments. Thus you have two tools for slightly more than the cost of one, to set either ¼" or ⅜" fasteners.

Where heavy-duty ⅜" fasteners are needed, the great driving power of the new Super-Power Jobmaster sets them instantly into 1" mild steel or into the hardest concrete.

Write us or ask your Ramset dealer for on-your-job demonstration of the all-around superiority of Ramset System for ease, speed, utility and economy.

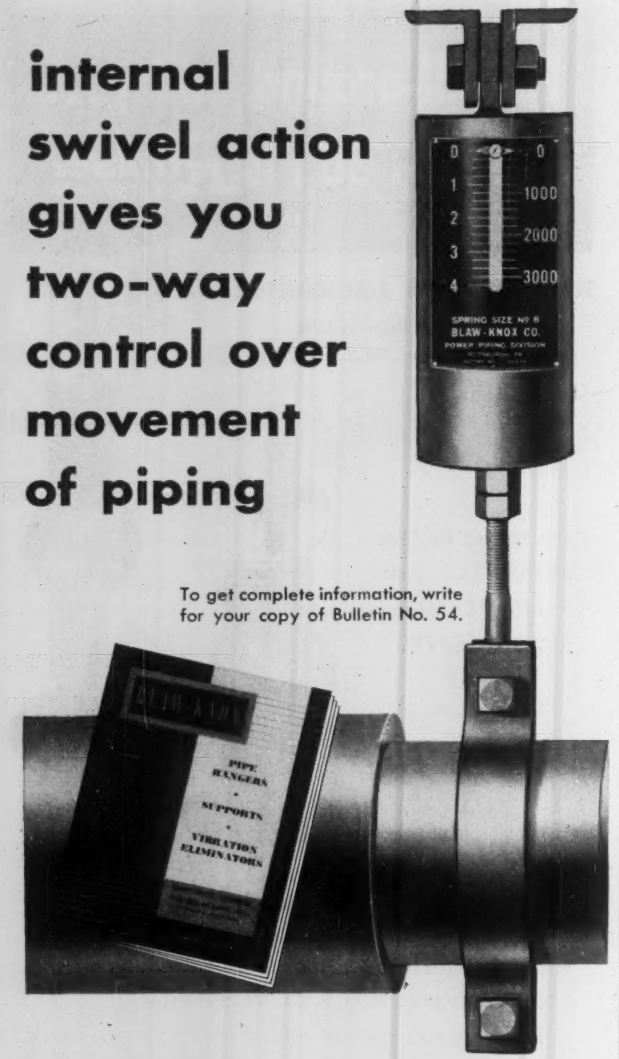
Ramset Fasteners, INC. RAMSET DIVISION, OLIN INDUSTRIES, INC.
12109 BEREA ROAD • CLEVELAND 11, OHIO

FIRST IN POWDER ACTUATED FASTENING

AN Olin PRODUCT

internal swivel action gives you two-way control over movement of piping

To get complete information, write for your copy of Bulletin No. 54.



You can readily control both the lateral and longitudinal swing movements of your piping up to 7° with our functional spring hanger.

For the hanger is designed with the Blaw-Knox patented *internal swivel action*, which permits movement while the hanger case itself remains vertical. Larger movements are readily accommodated by overhead roller assemblies. Each is a complete packaged unit ready to install.

In fact, our entire line of rigid hanger assemblies, overhead roller assemblies, vibration eliminators, as well as the functional hangers, are furnished as complete units . . . thereby saving you engineering time and eliminating expensive cutting, threading and assembling in the field.

Our engineers, who have had many years of experience, are available to both design and make recommendations for your hanger requirements.

BLAW-KNOX COMPANY • Power Piping and Sprinkler Division, Pittsburgh 33, Pa.

BLAW-KNOX

PIPE HANGERS

Complete line of functional spring hangers • rigid hanger assemblies • overhead roller assemblies • supports • vibration eliminators . . . plus complete prefabricated power piping systems for all pressures and temperatures.

open house for more than 1000 customers, suppliers and friends. The opening commemorated the consolidation and enlargement of two former Newark plants into one modern, single story plant devoted exclusively to the manufacture of environmental chambers used to simulate climatic conditions.

The Welding Products Div. of *A. O. SMITH CORP.* has been moved from Milwaukee to a larger plant in Elkhorn, Wis. A feature is a highly mechanized production line which makes extensive use of overhead conveyor systems as well as roller runways underfoot. According to *J. J. BOHMRICH*, division manager, production of welding machines now is doubled.

Completion of a $3½ million expansion program that doubles the size of its plants and triples productive capacity has been announced by *AMANA REFRIGERATION, INC.* The company is celebrating its 20th anniversary.

The *PENN VENTILATOR CO.*, Philadelphia, has announced acquisition of the Royal Ventilator Co. All rights, patents, designs and plant equipment originally held by Royal have been transferred to Penn.

The National Committee on Films for Safety has presented the *AIR REDUCTION SALES CO.* with an award of merit for its new welding safety film, "The Guy Behind Your Back." It deals with safety in the use of oxyacetylene cutting and welding equipment.

Plans for a $4 million expansion of plant and manufacturing facilities at the Babbit Road (Cleveland) plant of *CHASE BRASS & COPPER CO., INC.*, have been announced. Additions to the present buildings as well as the machinery and equipment necessary to increase tube production are included.

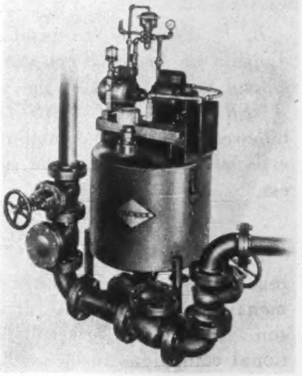
The *O. A. SUTTON CORP.*, manufacturer of "Vornado" air conditioners and air circulators, has launched a program designed to aid distributors, dealers and consumers. Four factory trained graduate engineers, headed by *RAY THOMPSON*, director of service, have begun a series of service training schools for distributors and dealers in key cities throughout the country. The field service engineers are *BOB HAAS, R. E. BOGARDUS, R. GARRISON* and *J. B. JONES*. After the training schools are completed, the field representatives consult with dealers on service problems.

To aid in proper installation and servicing of air conditioning equipment, *MUELLER CLIMATROL* has conducted three cooling schools this year for its customer service representatives. The five-day schools were held with the cooperation of the Milwaukee School of Engineering and are believed to be the first of their kind staged by a manufacturer in association with an accredited institu-

BRIEFS

from The YEOMANS GUARD

Tie this: One PACKEX* Unit Serves 10 Homes!



Here's good news for residential developments and small communities — Yeomans PACKEX: newest member of a distinquished family of pneumatic sewage ejectors, and *guaranteed dependable for low volumes.* Check these advantages:

- a single Packex unit in a sewage lift station will handle the waste from 10 homes — handles solids up to 2½ inches in volumes up to 20 gpm
- all the automatic simplicity and trouble-free operation characteristic of pneumatic ejectors
- a compact, handy, low-cost unit, factory-assembled with air compressor integral, easy and inexpensive to install
- ideal for future expansion — simply add units: usually installed in duplex to handle emergency "peaks"
- 3" or 4" connections; 20-foot head

☐ Ask for Leaflet 4420.

Better get full information on Yeomans PACKEX — for any low-volume sanitary project.

* A Yeomans Trademark

★ ★ ★

Good Tip from Panama Canal: For special pumps ASK YEOMANS

Recently 77 Yoemans Vertical Wet Pit Centrifugals set sail for the Canal Zone to handle drainage at the Panama Canal locks.

Aside from the agreeable size of the order, the pumps themselves are unusual in three respects:

1. HIGH HEADS . . . . up to 126 feet 2. LOW CAPACITY . . . . down to 50 gpm
3. LIMITED SPEED . . . . 1450 rpm, the maximum possible with the 25-cycle motors specified.

This is a good instance of *engineering pumps to fit special needs:* pumps with large diameter impellers but relatively small passages — pumps guaranteed to perform with dependable efficiency at low cost.

Moral: when your job calls for special equipment, talk to Yeomans.

☐ Bulletin 3-8001 covers Wet Pit Centrifugals.

★ ★ ★

oil . . tar . . paint . . acids . . alkalis . . molten metals . . salts . . abrasive liquids . . . .

the PNEU-PUMP will handle them

If you have a pet nuisance that is difficult or costly to handle — one of those listed or another we've missed — find out about the Pneu-Pump.

Here's a "quickie": Pneu-Pump is pneumatic, automatic; immune to high temperatures; handles *small* volumes as well as large. It's as near fool-proof equipment as you can find.

Above all, it's simple to manufacture — hence, low priced.

Sound interesting?

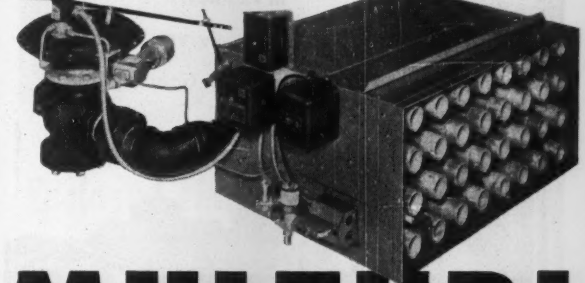
☐ Please send Pneu-Pump Bulletin

These items are typical of the helpful information contained in the Yeomans Guard, a useful publication concerned with pumping materials and the effective treatment of wastes — both domestic and industrial. A copy of the current issue will be sent promptly upon request.
Contact your local Yeomans representative, listed in the Yellow Pages under "Pumps" — or write us.

YEOMANS BROTHERS COMPANY

2000-5 N. Ruby St.
Melrose Park (Chicago), Illinois

NEW!



MULTURI

(Multiple Venturi)

GAS BURNER

Especially designed for . . .

HARD-TO-FIRE

- **SCOTCH MARINE BOILERS**

HARD-TO-FIRE

- **STEEL FIRE BOX BOILERS**

AT HIGH FIRING RATES AT HIGH EFFICIENCY!

A Premix Type Gas Burner, ideal for commercial and industrial size boilers and warm air furnaces. Gives maximum performance from hard-to-fire Scotch Marine and steel fire box boilers. Flame characteristics make the burner a natural for units with extensive refractory surface. Suitable for any gas at 4" gas pressure or more. Permits high firing rates at high efficiency. Simple to install, adjust, and operate. Completely Factory Wired and Assembled . . .
Ready for Immediate Installation !

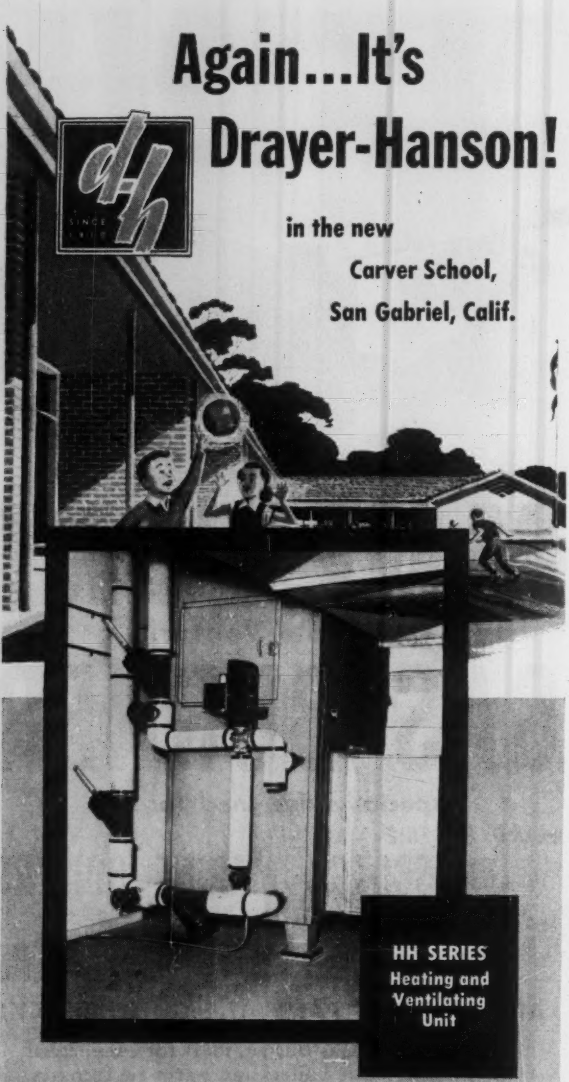
MULTURI BURNERS are available in standard modular units of 6 to 54 mixers. Capacities from 1,200,000 to 10,800,000 BTU/hr. Special units of higher capacities can be furnished. *Write or phone us for detailed information.*

Also Available — Nordensson Power Burners and Combination Gas-Oil Burners.

Code of Ethics SIGNER
SIGNER NO. 37

ROBERTS-GORDON APPLIANCE CORP.

DEPARTMENT HPAC • BUFFALO 6, N. Y.
Conversion Gas Burners • Gas Heating Equipment



Again...It's Drayer-Hanson!

in the new
Carver School,
San Gabriel, Calif.

In important installations everywhere ...units like this are giving the dependable, long-lived service which keynotes Drayer-Hanson products.

When your prospects say, "year-'round air conditioners," *compare,* feature by feature. You're bound to specify D-H!

With HH's, you can choose your arrangement: horizontal (HH), or vertical (HHV) units. 13 sizes, to 28,000 CFM. Coils for water, steam, direct expansion—or a combination.

You can't mistake them! *The extra features* you find in HH's are solving tough air conditioning problems, the country over.

Investigate! *Full details, request Bulletin C-4.20.*

drayer-hanson
INCORPORATED
3301 MEDFORD STREET, LOS ANGELES 63, CALIFORNIA

WE HEAR THAT

Continued

tion. The classes were conducted by Mueller Climatrol technicians, engineering school faculty and other refrigeration and air conditioning specialists.

B. P. FINKBONE, product engineer at the research division of Armco Steel Corp., recently received the 5th annual merit award of the galvanizer's committee of the *AMERICAN ZINC INSTITUTE.* Mr. Finkbone was honored for his past contributions to the art of galvanizing, especially the development of the Armco "Zincgrip" process.

FRIGIDAIRE is currently conducting a series of meetings with its district commercial and air conditioning sales managers to plan a sales drive for the coming selling season. The sales effort will be backed by factory promotional campaigns in all media, highlighted by celebration of the 25th anniversary of the firm's production of the first room air conditioner. Sales schools are also being set up for dealers.

What is believed to be one of the newest and most modern pump plants in the country was formally dedicated and opened to the public by *FAIRBANKS, MORSE & CO.* last month in Kansas City, Kan. Highlighting the four day ceremony was a forum on hydraulics and the problems arising from the increased demand for water in the United States. The new plant, on a 38½ acre site, employs about 900 persons. It consists of a completely mechanized foundry, a manufacturing department which covers 190,000 sq ft, two testing laboratories and a two-floor office section.

BURNHAM CORP. has purchased an interest in the *BERGER FURNACE CORP.*, according to an announcement from *BURNHAM BOWDEN,* president of the firm. The Berger firm, located in Belle Vernon, Pa., has been manufacturing heating and air conditioning equipment since 1936. *ANDREW H. BERGER* is president and general manager. The sales of Berger products will be made through its regular sales organization.

ARNOLD WEISSELBERG, president, treasurer and consulting engineer of Wyssmont Co., Inc., Long Island City, N.Y., has been elected a fellow of the *AMERICAN SOCIETY of MECHANICAL ENGINEERS.*

Also named as a fellow is *EMORY N. KEMLER,* professor of mechanical engineering and head of the machine-design and instrumentation division of the Institute of Technology, University of Minnesota. He is well-known for his work on fluid flow and on heat pumps. Articles by him have been published in HPAC.

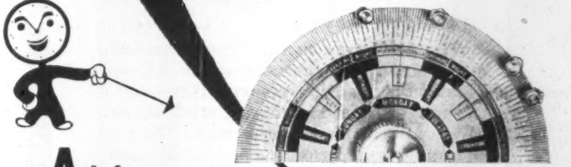
The boards of directors of *MATHIESON CHEMICAL CORP.* and *OLIN INDUSTRIES, INC.* have voted unanimously to submit to their stockholders at special meetings on June 29, a proposal to merge the two companies. New name of the firm will be *OLIN MATHIESON CHEMICAL CORP.*

Cut customer fuel bills 7 days a week

it's good business to always install a PARAGON 700 Series Calendar Time Switch on commercial heating units

YES, the good word gets around fast when a Paragon 700 Series Time Switch is on the job cutting heating bills. Heat is *automatically turned off* when not needed. Customer satisfaction through lower fuel bills *plus* fewer service "call backs" are big profit boosters for you! Check these features: :

- **COMPLETELY FLEXIBLE** — completely economical. Switch settings can be made for the entire week's schedule, yet easily and quickly changed. ON-OFF or OFF-ON operation can be as close as 3 hours.
- **FULLY AUTOMATIC** — set it, then forget it. Saves money weekends, for example: switch may be set to cut off heat Saturday noon, then automatically start regular heating cycle earlier than usual Monday.
- **INSTANTLY CHANGEABLE** — simply set the dial trippers at desired day or night hours. Total of 14 are supplied as standard equipment.

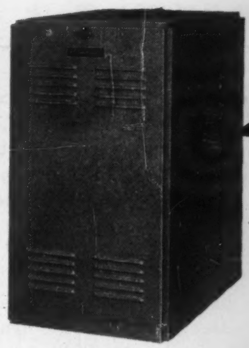


Ask for Bulletin HP-5407

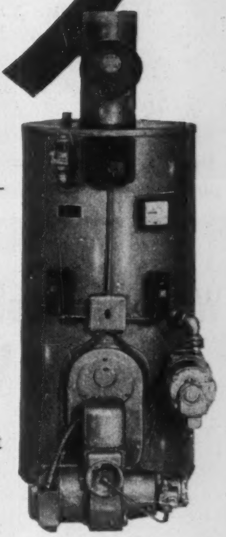
See your jobber, or write:

Dial is graduated in hours and half-hours. Night and day periods clearly separated. Available in 24, 120 and 240 volts; 25, 50 and 60 cycles. No complicated wiring. Lists as low as $27.50.

PARAGON ELECTRIC COMPANY
TWO RIVERS, WISCONSIN
World's Foremost Manufacturer of Time Controls



Enclosed find the Famous ALDRICH Boiler-Burner



- Always ahead in efficiency and economy, now the Gulf Stream is up to the minute in style, too. Choice of 5 sizes, with net ratings of 66,000 to 168,000 BTU per hour. Home owners have a choice—the space-saving "package" or standard model, with all controls and accessories easily accessible, or the Gulf Stream completely enclosed in a streamlined housing.

Ruggedly and simply built, the Gulf Stream picks up the heating load with immediate response. Special multiple-flue tube construction affords maximum heat extraction and quick transfer of heat to the boiler water.

With the tankless hot water coil added, the unit furnishes not only heat but hot water supply as well. Write for complete details.

GULF STREAM Standard

Comes fully erected, equipped with a complete set of automatic controls for 115 volt, 60 cycle operation, including thermostat, stack switch and limit control. Combustion chamber is installed. Top jacket removable without disconnecting water piping.

HOT WATER HEATERS

Internally galvanized, high delivery direct heating, no slow storage. **SERIES "B"**—93 to 850 GPH at 100° F. rise. **SERIES "C"**—100 to 255 GPH at 100° F. rise.

Gulf Stream
PACKAGE

Fully erected, pre-wired, accessory-equipped. Ready to set in place and connect. Easy to install and service.

ANOTHER BREEZE MARK PRODUCT

ALDRICH COMPANY
105 WILLIAMS STREET • WYOMING, ILLINOIS
A SUBSIDIARY OF BREEZE CORPORATIONS, INC.

WHO'S WHAT . . .

JACK SEARLS has been appointed assistant to the vice president-director of sales for *PENN CONTROLS, INC.* Mr. Searls was formerly general sales manager of Morrison Steel Products, Inc., and has been in the field of control application for more than 15 years. He will make his headquarters at Penn's main plant in Goshen, Ind.

JOHN R. CURRAN has been named director of engineering of the *HAMMEL-DAHL CO.* He joined the firm in 1945 as a design engineer and for the past four years has been chief design engineer.

C. A. PICKETT has been elected vice president of *ILLINOIS ENGINEERING CO.* Mr. Pickett has been general manager of the company since it was acquired by American Air Filter Co., Inc., in 1953. He has served with the American Air Filter companies since 1921.

JOHN HELLSTROM, vice president and director of sales of American Air Filter, and Mr. Pickett were also elected directors of Illinois Engineering.

ROBERT W. McKINLEY is the new technical representative for *PITTSBURGH PLATE GLASS CO.'s* glass division product development department. In his new position, Mr. McKinley will conduct technical development work in the field of glazing. Prior to his appointment he had been a product development engineer with the Pittsburgh Corning Corp.

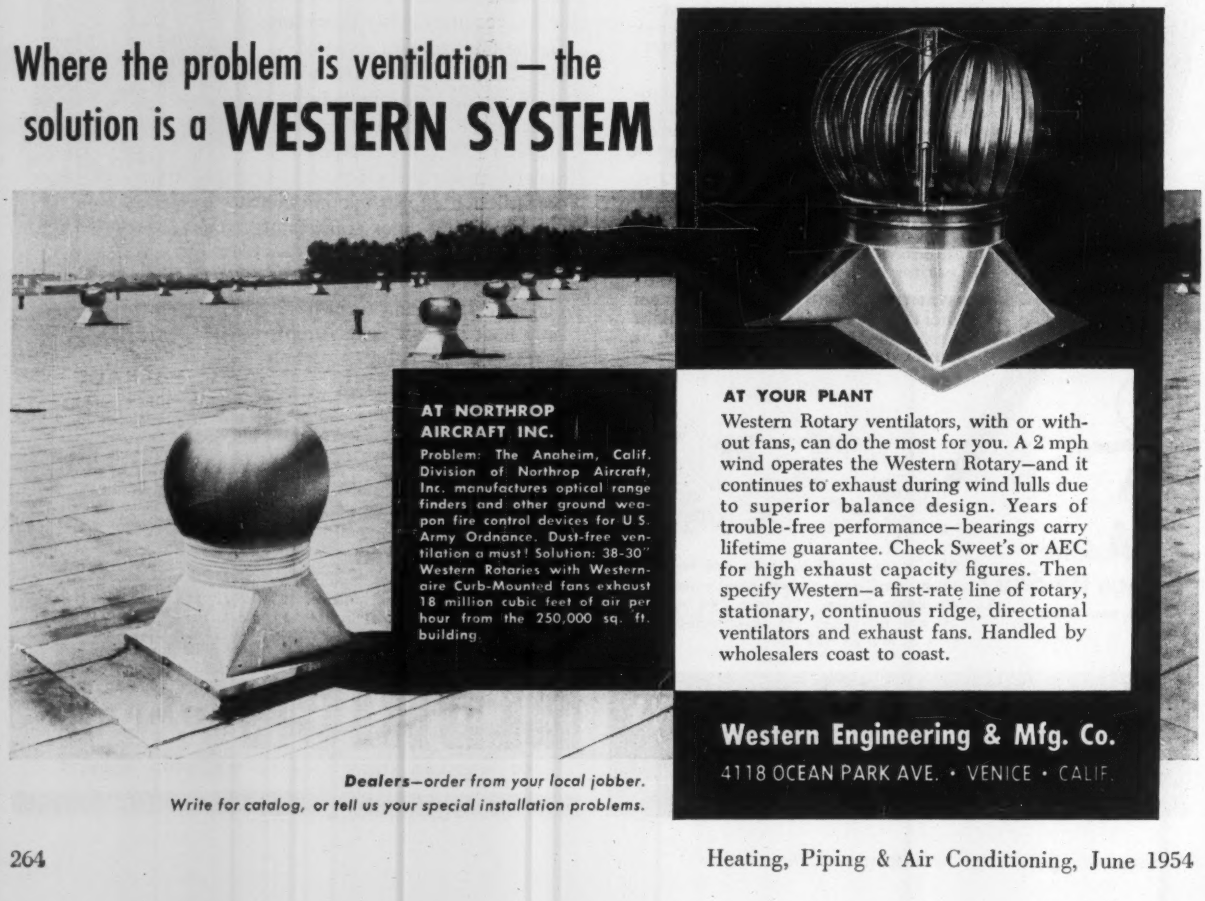
JACK SALMON, of Carrier Corp., is the new chairman of the Chicago section of the *AMERICAN SOCIETY OF REFRIGERATING ENGINEERS.* The section was founded in 1917.

HOWARD L. CLARY, assistant general manager and director of sales of the *BRYANT HEATER DIV.* of Affiliated Gas Equipment, Inc., has been elected a vice president of the corporation.

E. J. TRIBBLE, former works manager of the Harrison, N. J. works of *WORTHINGTON CORP.*, has been named assistant vice president in charge of manufacturing. *A. M. TULLO*, former works manager at the Wellsville, N. Y. plant, succeeds Mr. Tribble in Harrison. Taking over Mr. Tullo's position is *L. E. HAMMER*.

N. A. PALMER has joined the *COMBUSTIONEER DIV.* of the Steel Products Engineering Co. He will be active in the preparation of installation and service training programs.

A. B. DRASTRUP, recently elected executive vice president of *A. M. BYERS CO.*, was elected a member of the



Where the problem is ventilation — the solution is a **WESTERN SYSTEM**

AT NORTHROP AIRCRAFT INC.

Problem: The Anaheim, Calif. Division of Northrop Aircraft, Inc. manufactures optical range finders and other ground weapon fire control devices for U.S. Army Ordnance. Dust-free ventilation a must! Solution: 38-30" Western Rotaries with Western-aire Curb-Mounted fans exhaust 18 million cubic feet of air per hour from the 250,000 sq. ft. building.

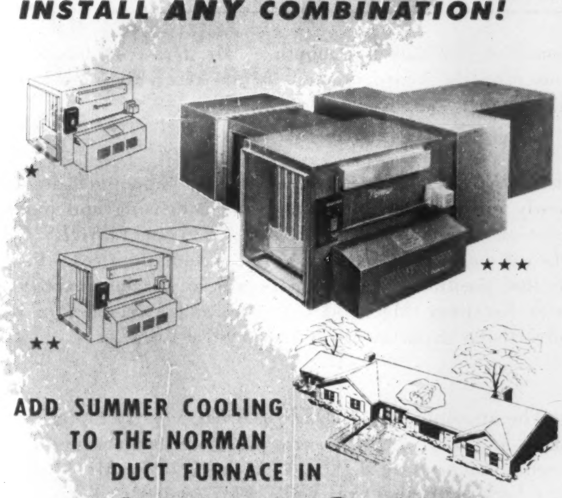
AT YOUR PLANT

Western Rotary ventilators, with or without fans, can do the most for you. A 2 mph wind operates the Western Rotary—and it continues to exhaust during wind lulls due to superior balance design. Years of trouble-free performance—bearings carry lifetime guarantee. Check Sweet's or AEC for high exhaust capacity figures. Then specify Western—a first-rate line of rotary, stationary, continuous ridge, directional ventilators and exhaust fans. Handled by wholesalers coast to coast.

***Dealers**—order from your local jobber.*
Write for catalog, or tell us your special installation problems.

Western Engineering & Mfg. Co.
4118 OCEAN PARK AVE. • VENICE • CALIF.

INSTALL ANY COMBINATION!



**ADD SUMMER COOLING
TO THE NORMAN
DUCT FURNACE IN**

One Prize Package

Norman winter-summer air-conditioner

. . . COMBINING a horizontal gas-fired furnace with independent cooling in ONE completely engineered package.

★ ***Start with the Norman Duct Furnace,*** if you like! A heating unit so flexible, it can be installed in the ducts of warm air and air conditioning systems for residential, commercial and industrial heating.

You'll find the Norman Duct Furnace adaptable to existing ductwork for use with the air handling unit of adequate summer air conditioning systems.

★★ ***Get set for summer cooling!*** Install the Norman Duct Furnace with its own damper compartment and blower now! Makes a complete gas-fired forced air heating system . . . ready for future summer cooling with most any refrigeration unit provided that ductwork is adequate for air conditioning.

★★★ ***Year 'round "Hidden Comfort" in ONE package:*** Norman Duct Furnace combined with cooling unit and blower makes complete year 'round air conditioning. The entire unit is so compact that it can easily and economically be installed in the attic or crawl space of to-day's modern homes.

Manufacturers of a Complete Line of Gas Heating and Air Conditioning Equipment

Norman® products company

1150 Chesapeake Ave., Columbus 12, Ohio

SEND for illustrated literature, complete with dimensions and specifications for your files

---

A NEW more reliable air conditioning method

with exact moisture control

**FOR
YOUR PROCESS
OR PROTECTION**

**FOR
TESTING PRODUCTS
OR MATERIALS
AT ANY TIME OF
THE YEAR**

Assembling Electronic Parts

Packaging Food Products

Drying Industrial Material

● This Niagara "Controlled Humidity" method gives you the **MOST EFFECTIVE** Air Conditioning because its cooling and heating functions are made completely separate from adding or taking away moisture. This assures you always a precise result. No moisture sensitive instruments are needed.

MOST FLEXIBLE. You can reach and hold any condition in response to instrument settings, or vary it as you wish.

EASIEST TO TAKE CARE OF. The machine is accessible, the control circuits are simple and easy to operate, and there are no solids, salts or solutions to be handled.

MOST COMPACT. It does a very large amount of work in a small space.

INEXPENSIVE TO OPERATE. At normal atmospheric temperatures (unlike systems that use refrigeration to dehumidify) it needs no summer re-heat.

Write for Bulletins 112 and 122

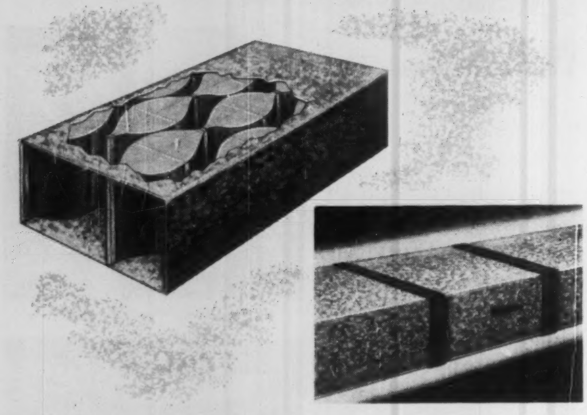
NIAGARA BLOWER COMPANY

Dept. HP, 405 Lexington Ave. New York 17, N. Y.

Niagara District Engineers in Principal Cities of U. S. and Canada

AT LAST . . . THE ANSWER TO AIR CONDITIONING NOISE

AIRCOUSTAT PROVIDES PACKAGED SILENCING OF AIR AND FAN NOISES



CHECK THESE ADVANTAGES:

- ✓ 7 foot unit reduces noise level below what 100 feet of duct lining could accomplish.
- ✓ Pressure drop less than lining entire duct.
- ✓ Selection is no problem. If it fits geometrically, it fits acoustically.
- ✓ Easy to install. Only simplest tools needed.
- ✓ Constructed of galvanized steel or aluminum for long-life durability.
- ✓ Available in 11 standard sizes from 6" x 6" to 48" x 56" for use with all styles and sizes of ducts.
- ✓ Acoustically engineered to assure correct silencing of conditioned areas.

WRITE TODAY FOR COMPLETE SPECIFICATIONS

INDUSTRIAL SOUND CONTROL, Inc.
45 Granby St., Hartford, Conn.
Please send me more information on AIRCOUSTATS.
Name ....
Address ....
City .... State ....

SILENCE SERVICE

Industrial Sound Control Inc.
45 Granby Street, Hartford 12, Conn.

WHO'S WHAT

Continued

board of directors last month. Mr. Drastrup fills a vacancy on the board created by the resignation of J. W. Marrinan.

GEORGE S. CHAPPARS has been appointed to the newly created post of director of advertising and public relations for *ROBERTSHAW-FULTON CONTROLS CO.* He will be at the Greensburg, Pa. executive offices. Prior to this position, Mr. Chappars was an account executive with Ketchum, MacLeod & Grove, and a member of the advertising department of Armco Steel Corp.

The appointments of *DEL MOERICK* as vice president, sales, and *A. L. TOPP* as vice president, engineering, have been announced by *A-P CONTROLS CORP.* Mr. Moerick has been with the firm since 1937 and Mr. Topp since 1939.

At the *POWERS REGULATOR CO.*'s recent annual stockholders' and directors' meetings, *H. F. BUCKMAN* was elected a director and secretary. *KENNETH M. STEVENS*, central division manager, was elected a vice president and *D. A. MacWATT*, manager of the New York office, was appointed assistant eastern division manager.

The *PERFEX CORP.* has announced that all merchandising activities of its Controls Div. will be under the supervision and management of *R. F. HORAN*. Mr. Horan is returning to Perfex after a three year leave of absence which began shortly after the outbreak of the Korean War when he was loaned by Perfex to the temperature controls industry to represent its association in Washington during the rearmament period.

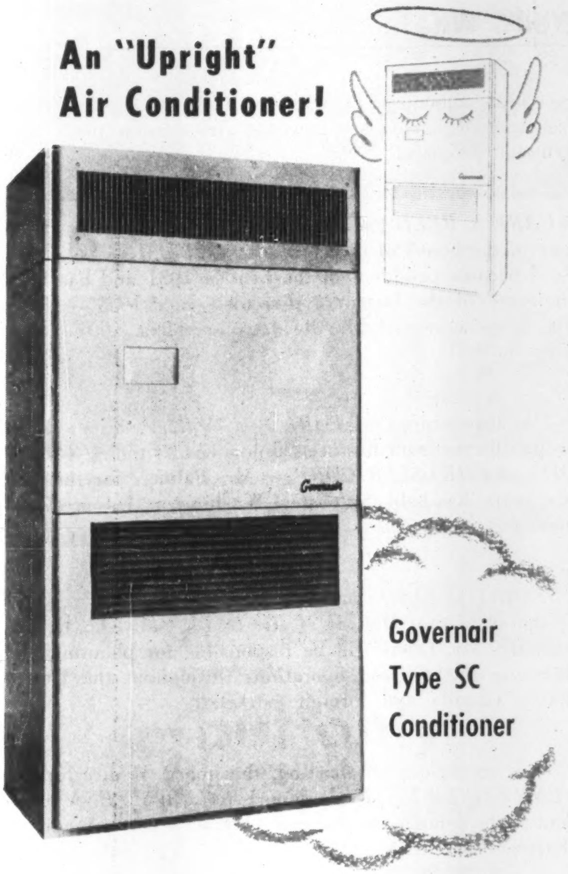
JOHN W. FRAZIER has been named field manager of air filter sales by *AMERICAN AIR FILTER CO., INC.* Mr. Frazier, for the past seven years, had been general sales manager of Trion, Inc.

GEORGE W. INGHAM has been elected vice president in charge of production of the *UNITED STATES AIR CONDITIONING CORP.* Mr. Ingham joined the company in 1950 as assistant to the works manager. He had previously served as general superintendent in charge of air conditioning at the Worthington Corp. plant in Holyoke, Mass.

JACK MOSES, formerly construction engineer at the Atlanta district office of *CARRIER CORP.*, has been named assistant manager of the Construction and Service Dept. at the Syracuse home office. He will handle the service technical group of the department.

The company also announced that *URBAN H. JOHNSON*, present assistant manager, will become acting man-

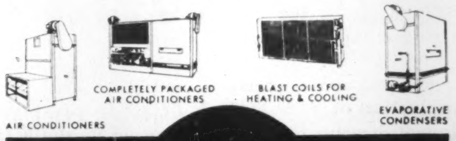
An "Upright" Air Conditioner!



Yes, this is an *upright* Governair self-contained conditioner—but that's not the reason for the halo.

The halo is there because this air conditioner behaves itself! Built to perform true air conditioning quietly and efficiently . . . it does just that! Flexibility, compact design, easy installation, dependability and economy are among its many virtues.

Available in capacities from 3 to 15 tons, the Governair Type SC Conditioner is the answer to your air conditioning needs in commerce, institutions, factories and homes. Choose *Governair* . . . originators* of completely packaged air conditioners!


AIR CONDITIONERS
COMPLETELY PACKAGED AIR CONDITIONERS
BLAST COILS FOR HEATING & COOLING
EVAPORATIVE CONDENSERS

GOVERNAIR

*Type SCU Conditioners Patent No. 2,297,938

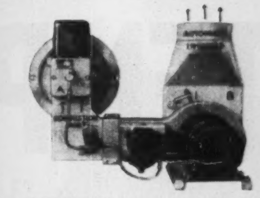
GOVERNAIR CORPORATION • 513 N. Blackwelder • Oklahoma City, Okla.

Tjernlund

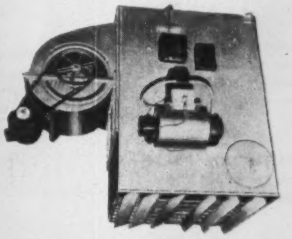
The only warm air heaters with BUILT-IN, AUTOMATIC DRAFT INDUCER

Only TJERNLUND Quick Heat gives you the *automatic* and *positive* draft inducer built right into the burner! No draft "prover" needed. And that's only one of many important and exclusive features that have made TJERNLUND a leading warm air heating system for the last fifteen years.

There is a TJERNLUND Quick Heat model for *every* warm air heating requirement.

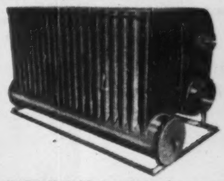


TJERNLUND burner with built-in draft inducer.



Suspended type TJERNLUND heater.

- ★ **Capacities 80,000 to 3,000,000 btu/hr**
- ★ **Fired with either oil or gas**
- ★ **All units equipped with sirocco type blowers**
- ★ **Exclusively designed *vertical* heat exchanger**



TJERNLUND heat exchanger. No burn-outs.

SALES REPRESENTATIVES!

Sales engineers and manufacturers' representatives with successful heating experience and good contacts in their territories will find our proposition interesting and profitable. After fifteen years in the Upper Midwest, we are now expanding our sales. We offer a good name, the finest products, close factory cooperation, and unlimited opportunity. Write today giving details of experience, territory, etc.

Tjernlund MANUFACTURING CO. QUICK HEAT

2140 KASOTA AVE., ST. PAUL 14, MINN.

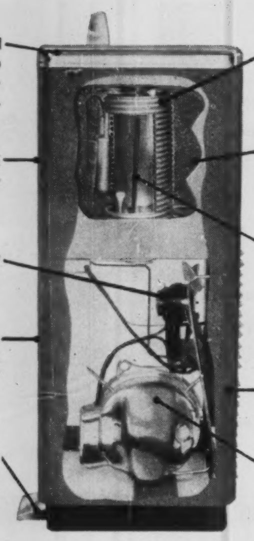
We invite you to...

LOOK INSIDE

it's the sturdy . . .

TEMPRITE

Drinking Water Cooler



SANITARY Stainless Steel Top is EXTRA DEEP. No splash from overflow — no spurt from nozzle.

WATER TEMPERATURE can be adjusted as desired.

FAN MOTOR assembly lifetime lubricated.

CABINET PANELS are heavy gauge sheet steel. Neutral grey baked finish.

POSITIVE ACTION FOOT PEDAL is standard, yet hand or dual control is available if desired.

COOLER and storage tank has all-welded seams.

MOISTURE PROOF, vermin proof, presettled cork insulation.

PATENTED INLET Water Tube increases efficiency, protects cooler against damage from freeze up.

ALL JOINTS and connections silver soldered.

HERMETICALLY SEALED compressor lubricated for life.

The Cooler with the DEEP Stainless Top!

Stainless Steel won't crack or chip.

Easy to clean and keep clean!

Temprite Products Corporation
P. O. Box 72-L, East Maple Rd.
Birmingham, Michigan

Send me distributor franchise information, I am interested in handling Temprite Water Coolers.

Name____________________

Address____________________

City__________ State__________

WHO'S WHAT

Continued

ager while manager *GEORGE T. BAUM* carries out special assignments in connection with Carrier's new plant construction program.

CARL S. REED has announced his retirement as chairman of the board of directors of the *LUMMUS CO.* Mr. Reed became president of the firm in 1931 and has been chairman of the board of directors since 1949. J. F. Thornton succeeded Mr. Reed as president of the company in 1951.

The appointment of *EARL PALMER* as national sales promotion manager has been announced by the *AIRTEMP DIV.* of *CHRYSLER CORP.* Mr. Palmer, for the past two years, has held the post of Washington, D.C. regional manager.

HARRY E. LEWIS has been appointed general manager of the Insulation Div. of *M. H. DETRICK CO.* In this capacity, Mr. Lewis will be responsible for planning and directing the division operations throughout the United States, Canada and foreign markets.

At a recent annual meeting, the board of directors of *PENN CONTROLS, INC.*, named *RALPH S. PENN* president of the company to succeed *ALBERT PENN*, appointed chairman of the board.

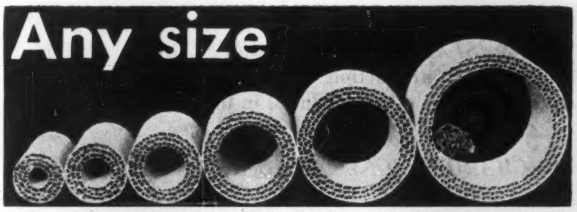
E. W. SEAY has been appointed manager of advertising and sales promotion for the new Air Conditioning Div. of the *WESTINGHOUSE ELECTRIC CORP.*

Two new appointments announced by the *LINCOLN ELECTRIC CO.* are those of *ALBERT PATNIK* as dealer sales manager, and *ROBERT E. SAGE* as assistant to executive vice president J. S. Roscoe. Mr. Patnik will have responsibility for the management of the Lincoln dealer organization and Mr. Sage will act as an administrative assistant for sales.

The *IRON FIREMAN MFG. CO.* has announced the appointment of *STANLEY B. GRAFT* to fill the newly created post of export manager. The establishment of this position is part of the company's program for expansion in the export field.

The promotion of *WALTON A. LEAN* to vice president and technical director has been announced by the *WILCOLATOR CO.* In his new post Mr. Lean will be responsible for the coordination of sales, engineering and production.

MELVIN W. PAULY has been named general manager of sales, and *HAROLD H. LAYRITZ*, assistant general manager of sales, of the *LUNKENHEIMER CO.* *HARRY*



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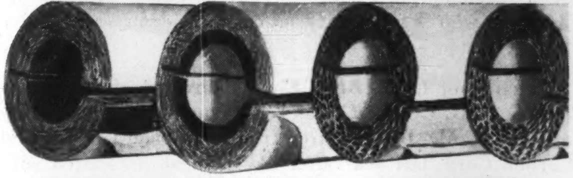
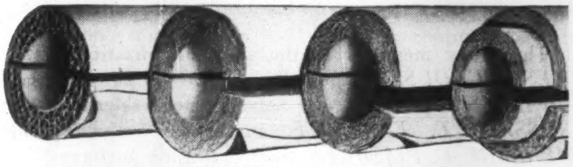

ANTI-SWEAT ALASKA FROSTPROOF SIXCELL & MULTICELL


AIRCELL SPONGED FELT WOOL FELT

—but only ONE quality ...the FINEST!

Sal-Mo Pipe Coverings are made to the most exacting standards, to insure perfect fit and maximum efficiency. Since they cost no more than other standard makes, don't simply order "pipe coverings." Specify, and insist on getting

Sal-Mo

PIPE COVERINGS

FREE! Generous sample, put up in attractive carton with telescope top, free on request. In ordering, please specify type of covering in which you are specially interested.

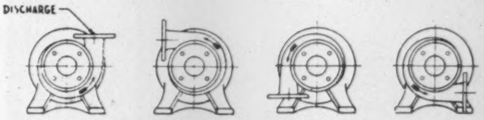
SALL MOUNTAIN CO.
HAMILTON, OHIO

WEINMAN
Close
Coupled
Centrifugal
Pumps

lower in first cost, lower in maintenance cost!

Installation of air conditioning systems is sometimes a tricky business. Space in existing buildings is usually limited, making pump replacement a real problem. WEINMAN close coupled centrifugal pumps are designed to lick this problem, and here's the way they do it:

WEINMAN pumps require less space to begin with. They can be mounted in any position. Note, too, that the discharge can be turned to any one of four different positions.



This means you can mount a WEINMAN pump on the wall, suspend it from the ceiling, bottom or side of a tank, or on the floor . . . important where installation space is limited.

If pumps are a problem that's plaguing your installations, call a WEINMAN Centrifugal Pump Specialist. He has the solution and the pumps, to solve the toughest jobs.

"Centrifugal Specialists"
The WEINMAN Pump Mfg. Co.
296 Spruce St. Columbus 8, Ohio

WHO'S WHAT

Continued

A. BURDORF, vice president in charge of sales, is beginning his 50th year with the company.

NORBERT F. EICHELSBACHER has been promoted to the position of general manager of *TRION, INC.* He is also on the board of directors. *NEIL R. TROUT* has been appointed sales manager of the eastern division.

ARTHUR E. SLAASTED now is advertising and sales promotion manager of *YOUNG RADIATOR CO.* Before joining Young, Mr. Slaasted was associated with the advertising department of Allis-Chalmers Mfg. Co.

ALLEN WILSON, well-known authority on sound control, has joined the *BURGESS-MANNING CO.* as director of merchandising of the Architectural Products Div.

ERIC J. FANTON and *HARRY N. PATRONIK* have joined the engineering staff of the Dust Control Dept. of *PANGBORN CORP.* Mr. Fanton's position is dust control design and development engineer, and Mr. Patronik's position is that of dust control application engineer.

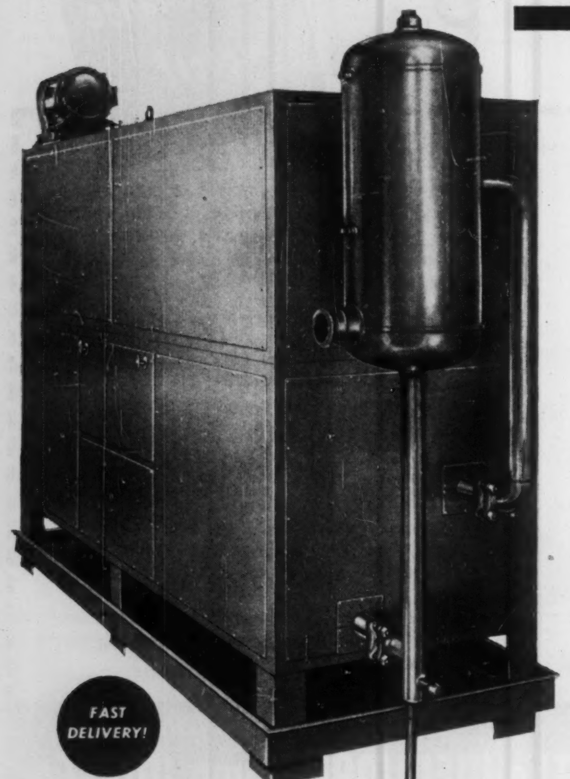
RAYMOND A. STOESSER has been appointed vice president, general manager of manufacturing of the Plumbing and Radiator Heating Div. of *AMERICAN RADIATOR & STANDARD SANITARY CORP.* He is in charge of the production of heating and air conditioning equipment, plus other products, in the division's 16 plants.

RICHARD G. JONES was elected to the board of directors and *FRANK H. WEMPLE* was elected treasurer at the annual meeting of *HANDY & HARMAN.* Mr. Jones is secretary and controller of the company. Mr. Wemple, who has been assistant secretary and the head of the company's Trading Dept., succeeds Howard W. Boynton, who is continuing as vice president.

Election of *C. K. BRYCE* as a director of *ORANGEBURG MFG. CO., INC.* has been announced by company officials. Mr. Bryce retired from the Union Carbide and Carbon Corp. last year after having been associated with the corporation for 42 years.

Three key members in the sales organization of the *WESTINGHOUSE* Lamp Div. have been advanced. *CHARLES E. ERB* has been named general sales manager, *RUSSELL E. EBERSOLE*, marketing manager, and *HERBERT E. PLISHKER*, merchandising manager.

EDWARD J. DETGEN and *WILLIAM M. KELLER* have been elected vice presidents of *OWENS-CORNING FIBERGLAS CORP.* Mr. Detgen had been serving as general sales manager of the Fiberglas General Products



AVAILABLE **RIGIDBILT** PRODUCTS

CEILING TYPE AIR CONDITIONING UNITS
FLOOR TYPE AIR CONDITIONING UNITS
VENTILATING UNITS
DIRECT EXPANSION COOLING COILS
WATER COOLING COILS
STANDARD STEAM HEATING COILS
STEAM DISTRIBUTING TUBE HEATING COILS
HOT WATER HEATING COILS
SUSPENDED TYPE UNIT COOLERS FOR ALL REFRIGERANTS
FLOOR TYPE PRODUCT COOLERS

SPECIAL COILS FOR ALL REFRIGERANTS
DESIGNED TO MEET THE MOST EXACTING REQUIREMENTS

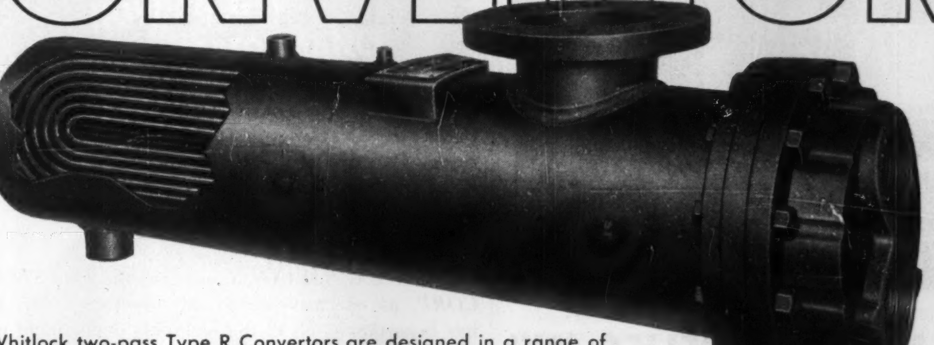
RIGIDBILT IS BETTER BUILT—Write for Catalog.

RIGIDBILT INC.

2852 W. FULTON ST. CHICAGO 12, ILLINOIS

Floor Type Product Cooler
FOR FULL-FLOODED AMMONIA.
Units of this type for all refrigerants and applications.

CONVERTORS



Whitlock two-pass Type R Convertors are designed in a range of standard sizes which make these compact, efficient units promptly available at low cost. Construction is of standard U-tube design, utilizing a steel pipe shell, seamless copper tubes, and cast iron head for typical operating pressures. Whitlock Convertors are used for space heating systems in all types of buildings and they furnish hot water with minimum pressure drop. Ask for further information.

The Whitlock Manufacturing Co., 44 South St., Hartford 10, Connecticut. In Canada: Darling Brothers, Ltd., Montreal.

Whitlock

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An Entirely New Volume — 529 Pages
15 CHAPTERS — 6"x9¼"

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DISTRICT HEATING PLANTS
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- ***INDUSTRIAL AIR CONDITIONING HANDBOOK***

Information on the purpose, cost, design, operation and maintenance of both process and comfort air conditioning systems in manufacturing plants of many kinds. The combined knowledge and experiences of 33 prominent engineers, every one a designer or in direct charge of the largest factory air conditioning systems in operation. This shows other engineers how air conditioning helps speed production, improve products, increase worker efficiency and operate systems economically. 186 pages, $1.50

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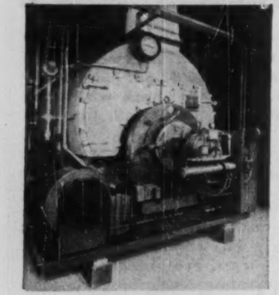
A practical manual on fume removal, dust collecting, ventilating and exhaust systems for industrial plants. Tells how to design correctly and provide for various ventilation requirements . . . make measurements and analyses of fumes, mists and dusts . . . plan exhaust systems, etc. Twenty eminent authorities contributed also to detailed descriptions of systems in actual operation in many plants. 134 pages, $1.50

- ***SNOW MELTING MANUAL***

Complete information on correst design, installation and operation of snow melting systems is offered in this reprint of articles originally published in "Heating, Piping and Air Conditioning." Design data based on a study of—and others' actual experience with—over 100 snow melting systems of all kinds. Applications illustrated, for loading platforms and docks; sidewalks; roads; driveways; marquees; parking areas; runways; railway switches, etc. 20 pages, $1.00

MICHIGAN FIRM "FLIES IN" NEW RAY FORCED DRAFT 'PACKAGED' BURNER

DEARBORN, MICHIGAN — A new RAY forced draft 'packaged' oil burner was installed in the new plant of Contract Specialties Company here after a flight from the West Coast via Flying Tiger according to E. F. Freeman, mechanical engineer of the company.



Ray Engineering Company of Detroit, oil burner contractor on the Contract Specialties installation, reported combustion efficiency at 83.3% after special tests. Hurless E. Bankes was architect for the Contract Specialties building; Stanley Carter Co. was heating contractor. General contractor was H. E. Campbell Construction Company.

This Ray Size 5 FDAR-144 heavy oil burner unit was one of the first local applications of Ray Oil Burner Co.'s new 'packaged' units, which are available with all combustion components necessary for fully automatic operation on oil, gas, or combination gas-oil; factory wired, piped, mounted on a structural steel base, ready for installation on the boiler front.

Send for Catalog Unit Y.

RAY OIL BURNER CO.
Since 1872
1301 San Jose Avenue • San Francisco 12, California
Atlantic Seaboard Div. • 629 Grove St., Jersey City 2, N.J.
The BURNER with an INTERNATIONAL REPUTATION
DISTRIBUTORS IN ALL PRINCIPAL CITIES OF THE WORLD

WHO'S WHAT

Continued

Div. Mr. Keller had been general factories manager of the Fiberglas Textile Products Div.

H. H. FALKINGHAM has been appointed manager of distribution development af the *GENERAL ELECTRIC CO.'s* Air Conditioning Div. Mr. Falkingham will represent the division's marketing department in working with product departments, regional sales organizations and distributors.

JOHN LACHMANN has joined the *CHESTER CABLE CORP.* as executive technical director. Mr. Lachmann has been employed in the technical department of DuPont and has done extensive work with nylon and polyethylene.

New chief engineer of the *BRUNNER MFG. CO.* is *JOSEPH RAUFEISEN.* He had been manager of the mechanical department of Wescott and Mapes for the past three years. From 1932 to 1950, Mr. Raufeisen owned a consulting engineering firm in Switzerland.

JAMES A. MULCAHEY, director of sales for *BUSH MFG. CO.,* has assumed similar duties at *HEAT-X-CHANGER CO.,* a wholly-owned subsidiary of Bush. He will direct sales efforts of both concerns. New general manager of Heat-X-Changer is *ALAN DECKER.*

EDWARD R. WALSH, JR. has been elected vice president in charge of sales of *YORKTOWNE MACHINE CO., INC.* Mr. Walsh will direct the setting up of a distribution organization for the company's new evaporative condenser.

W. HARVEY THOMPSON has been named assistant to the executive vice president of *H. K. PORTER CO., INC.* He succeeds *R. F. ALLEN,* who has been elected a vice president in charge of Porter's Buffalo Steel Div.

IN THE TERRITORIES . . .

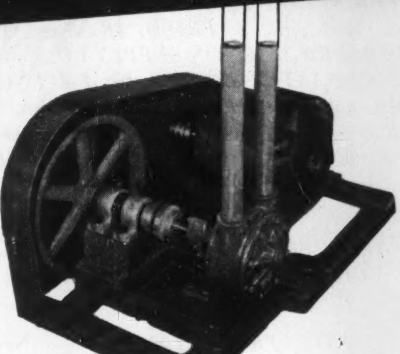
For the *TRANE CO.* — New location of the Little Rock, Ark. sales office is Room 718, Pyramid Bldg. *ROWE HILL* is sales engineer in charge and works through the Memphis, Tenn. sales office.

For *MARLO COIL CO. — LAURENCE TRANT & CO.* of Richmond and Norfolk is now sales representative in Virginia.

For *YORK CORP.—J. R. JONES,* previously sales engineer in Houston, has been transferred to the San Antonio branch office as branch manager.

For *PRAT-DANIEL CORP.,* Thermobloc Div. — *GEORGE F. BEGOON* is director of the southeastern sales district. The district includes North and South Carolina,

HOW TO GET FUEL PUMP PERFORMANCE THAT CUTS MAINTENANCE COSTS



Install TUTHILL TYPE SU *Pumping Units For Dependable Service in Industrial Heating*

Tuthill Type SU multiple V-belt pumping units provide structural and performance advantages for dependable, uninterrupted operation that add up to reduced maintenance expense.

Features like these make the SU outstanding for handling heavy fuel oils in industrial heating:

- ★ **Motors up to 5 h.p. mounted on slotted slide rails for easy adjustment or replacement. No drilling or tapping required.**
- ★ **Cast iron base with mounting bolts and adjustments easily accessible.**
- ★ **One-point belt-tension adjustment.**
- ★ **Jack shaft, supported by ball-bearing pillow blocks, carries entire weight of pulley and absorbs belt tension.**
- ★ **Pump, jack shaft and pillow blocks available as separate unit.**
- ★ **Pump and jack shaft direct-connected by flexible coupling for better alignment and simplified mounting.**
- ★ **Wide range of pump models and capacities.**

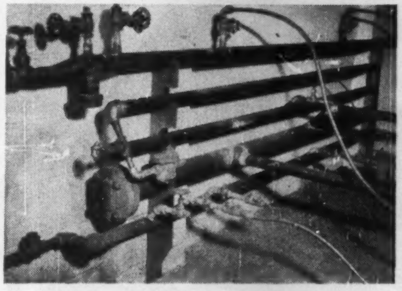
Complete data is presented in Tuthill Catalog No. 107. Write for your copy today.

TUTHILL
PUMPS FOR THE PURPOSE

TUTHILL PUMP COMPANY
Dependable Pumps since 1927
939 East 95th St., Chicago 19, Illinois
Canadian Affiliate: Ingersoll Machine & Tool Co., Ltd.
Ingersoll, Ontario, Canada

MORE NET PROFIT from piping jobs

Welded fabrication of these economizer tubes cuts costs from $475 to $150. The 10 foot tubes have eight fins in two pipe sections.

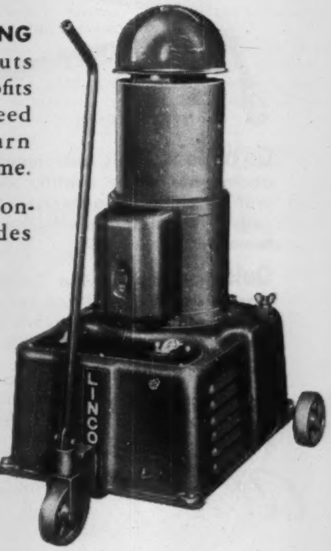


Feeder lines for supplying steam, air, water, vacuum and return are welded in less time . . . at less cost using "Lincwelder" power.

FASTER, EASIER WELDING with "Lincwelder" cuts costs . . . increases profits on every job. You speed welding, eliminate burn through, cut cleaning time.

"Lincwelder's" Dual Continuous Control provides unlimited combinations of *type* of arc and arc *intensity.* As a result, fewer manhours are needed for quality welding.

Start your cost reduction now. Have your Lincoln representative show you how to save time and money on piping jobs with "Lincwelder." Or write for free Lincoln Bulletin 1332.



Lincwelder DC-250-MK . . . low priced Lincoln DC motor driven welder for fast, easy welding. Costs less than other welders of similar type and capacity.

THE LINCOLN ELECTRIC COMPANY
Dept. 3803 • Cleveland 17, Ohio
THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

read low surface temperatures in 5 Seconds Accurately!

On all Jobs...this instrument is invaluable for balancing hot water heating systems, reading floor, wall or ceiling temperatures, checking refrigerated coils, insulation and all other low temperature surfaces.

Quick Accuracy...the 2300 assures the highest standards of speed, accuracy and dependability—you can read most low surface temperatures in 3 to 5 seconds.

Saves Money...the speed and precision eliminate time-wasting rechecking. It is a direct reading unit—no conversion tables, balancing slide wires or batteries are necessary.

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Please send me a copy of Bulletin 2146.

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WHO'S WHAT

Continued

Georgia, Alabama and Florida. Headquarters office is at Fort Lauderdale, Fla.

For *UNIVERSAL DIFFUSER CORP.* — New sales agents are: *CONTROLLED AIR CO.*, San Francisco; *FREDERICK CO.*, Spokane, Wash.; *WM. N. HART*, Jackson, Mich.; *D. B. FRIED, JR.*, New Orleans; *SO. TEXAS REFRIGERATION SUPPLY CO.*, Corpus Christi; *LEWIS C. BAXTER CO.*, Toledo; *E-Z ENGINEERING CO.*, Milwaukee; *H. M. LUDLOW*, Jackson, Miss.; *J. P. ASHCRAFT CO.*, Fort Worth, Dallas, Shreveport; *RUSSELL R. GANNON CO.*, Louisville; and *TRI-AIR INC.*, Cincinnati.

For *CLEAVER-BROOKS CO.*, New York boiler sales office — *GILBERT FOSTER* is the new sales engineer.

For *OAKITE PRODUCTS, INC.* — New technical service representatives are: *RICHARD J. PRICE*, Portland, Ore.; *MALCOLM N. GRAY*, Lincoln, Neb.; *JOHN N. LEE*, Miami, Fla.; *GALE R. MILLER*, Cincinnati; *KENNETH L. OLIVER*, Fort Wayne; *THOMAS D. ELLSWORTH*, Grand Rapids; *D. O. MUNDALE*, Asheville, N. C.; *HASKELL WILDER*, LaCrosse, Wis.; *LLOYD W. KAGLEY*, Knoxville; *WILLIAM D. HUDSON*, Topeka; and *HENRY W. DIETER*, Youngstown.

For *ORR & SEMBOWER, INC.* — *OGLE ENGINEERING SALES*, Louisville, is sales and service representative handling the "Powermaster" packaged boilers in central and western Kentucky. Offices are at 3207 Preston Highway. Mail address is Box 74, St. Matthews Branch, Louisville 7. *FRANK J. OGLE, JR.* is manager of the firm.

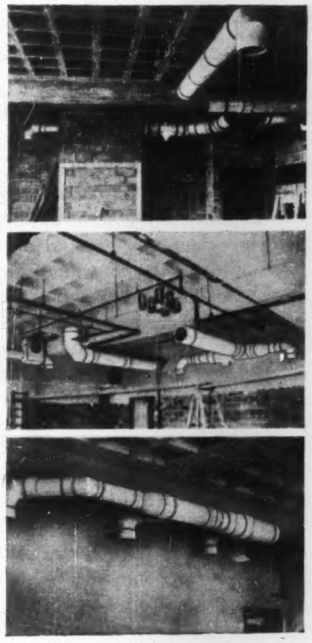
For *SERVEL, INC.*—The *B. J. LEE CO.* of Memphis now is air conditioning distributor for western Tennessee, northern Mississippi, northeastern Arkansas and three counties in southeastern Missouri. The Lee company is located at 236-238 Adams Ave.

For *CHRYSLER-AIRTEMP—WARREN BARR SUPPLY CO.* has been appointed Chicago area distributor for heating and air conditioning equipment. As a warehousing distributor, it will maintain complete inventories to service heating contractors.

For *DRAVO CORP.*, Machinery Div. — A new southwest office has been opened at 1615 Blodgett Ave., Houston 4, to handle the sale of prefabricated steel and alloy piping, space heaters and process drying equipment. *GEORGE R. BEIDLER*, formerly of the New York office, has been appointed district sales manager.

For *McQUAY INC.*—*J. L. MYERS* of San Francisco is the new heating and air conditioning products sales representative in the California territory.

Specify the Vent Pipe that's built to last . . .



Transite® Industrial Vent Pipe

Stands up under corrosive conditions

Transite Industrial Vent Pipe has been successfully used for many years, in industry after industry, to overcome the corroding action of highly aggressive fumes and vapors. In the photographs shown above, this durable pipe is being installed for venting corrosive fumes so frequently encountered in chemical laboratory installations.

This vent pipe will not only give long trouble-free service, but give it with very little maintenance because:

1. **It's made of asbestos and cement—cannot rust or rot.**
2. **It needs no painting or other preservative finish—ever—whether used indoors or out.**
3. **It is resistant to many corrosive fumes, mists and gases.**

Transite Industrial Vent Pipe—as vents, ducts, stacks for indoor or outdoor use, for laboratories and industrial plants—is adaptable to a wide range of requirements. It is quickly and economically installed. It is light, strong and durable . . . is easy to assemble . . . can be worked with ordinary tools. Write for your free copy of DS-336 "Transite Industrial Vent Pipe for Ducts, Vents and Stacks." Address Johns-Manville, Box 60, N. Y. 16, N. Y.

JOHNS-MANVILLE JM PRODUCTS

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TRANSITE INDUSTRIAL VENT PIPE

AN ASBESTOS-CEMENT PRODUCT

THE LOW COST WAY TO HEAT WITH GAS

Lo-BLAST Economite Gas Conversion Burner

Lo-BLAST

POWER-TYPE GAS CONVERSION BURNER

CAPACITIES 70,000 TO 20,000,000 BTU INPUT

Regardless of the size of the heating plant, Lo-BLAST Gas Burners deliver more heat per fuel dollar. In 19 years of actual operation, these power-type units have consistently cut fuel and service costs.

Because primary and secondary air is perfectly controlled from a blower source, the Lo-BLAST Burner is independent of variable natural draft. Hence it is particularly well suited for downdraft boilers. Combustion is completed in an incandescent firebox, with radiant heat applied to crown sheet as well as side walls.

Other features include soft, quiet flame . . . standard controls with positive acting pilot and blower safetys . . . sturdy, fool-proof design . . . easy to install because completely assembled and factory-tested on gas . . . competitively priced.

A Lo-BLAST dealership is profitable! Complete range of capacities and a nation-wide reputation for economy make this burner a strong seller. Write for information.

The standard Lo-BLAST Gas Conversion Burner

MID-CONTINENT
METAL PRODUCTS CO.
1960 N. Clybourn Ave., Chicago 14, Ill.

CUT COST
with **FLEXAUST***

The high-quality flexible spiral-wire reinforced hose

SIZES
1¼ in. to 36 in. ID

MOVE Air, Dust, Gases, Materials
BY Pressure, Suction, Gravity

Check these *Basic Economies:*

✓ **INSTALLED IN A HURRY**—Even by unskilled labor. Easy-to-connect accessories. Completely air-tight. No costly layout preliminaries.

✓ **STRONG, LONG LASTING**—Bonded, double-ply. Stands up through abrasion, aging, corrosion, moisture, chemicals, unlimited flexing.

✓ **MULTI-PURPOSE**—Protects products and health from dust and fumes, improves comfort, makes many jobs simpler, more efficient.

✓ **EASY TO MOVE**—Light, fully portable, completely flexible with negligible stress for moving collector heads.

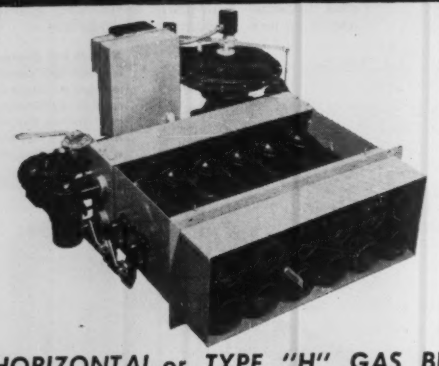
For sizes, coatings, accessories, and flow characteristics ... write for catalog today.

Your local distributor has Flexaust—as well as the companion ducting, *Portovent.*

THE FLEXAUST COMPANY
Dept. HP-6, 100 Park Avenue, New York 17, New York
Formerly American Ventilating Hose Co.

FLEXAUST* PORTOVENT* BLOFLEX*
*Trade-marks

for Gas Firing



The *HORIZONTAL* or *TYPE "H"* GAS BURNER
for Scotch Marine or other type boiler where the "Inshot" type of firing is preferred. Multiple flame retention heads assembled in a heavy gauge housing with balanced air louvres and specifically designed pilots provide the maximum in flexibility and dependability. Complete prewiring and factory assembly of controls simplifies, and cuts hours from installation time.

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Gordon & Piatt
P.O. BOX 332
WINFIELD, KANSAS

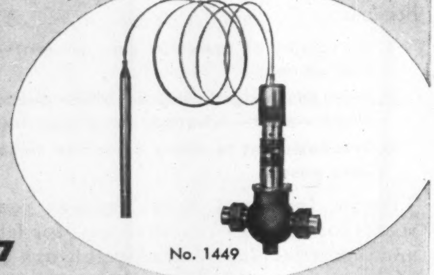
NEW BOOKS & REPORTS...

Air Conditioning and Refrigeration Standards

Publication of the first set of *ARI-Standards* has recently been announced by the Air-Conditioning and Refrigeration Institute. This edition, which includes 31 standards, also includes a tentative application engineering standard for year 'round residential air conditioning which covers the institute's recommendations for calculating residential cooling loads. Other standards cover room air conditioners, self contained air conditioners, compressors and condensing units, heat transfer products, and central station air conditioning and refrigeration equipment.

Following is a list of individual standards and their prices: Standards for Room Air Conditioners, including a cooling load estimate form, 35 cents; Standards for Self Contained Air Conditioners, 35 cents; Standard for Open Type Refrigeration Condensing Units, 20 HP and Smaller, 35 cents: Tentative Standard for Water Cooling Towers for Use with Refrigerating Equipment, 50 cents; Tentative Standards for Ammonia Condensers and Receivers, $1.00; Tentative Standards for "Freon" Condensers and Receivers, 50 cents; Tentative Standards for Water and Brine Coolers, 50 cents; Tentative Standard for Application of Refrigerant Heat Transfer Equipment, 35 cents; Standard Nomenclature for Reciprocating Compressors, 35 cents; Standards for Ammonia Compressors and Compressor Units, 50 cents; Standards for "Freon" Compressor and Condensing Units, 25 HP and Larger, 35 cents; Standard for

new **Klipfel**
tank thermostat valve



with 7 important advantages

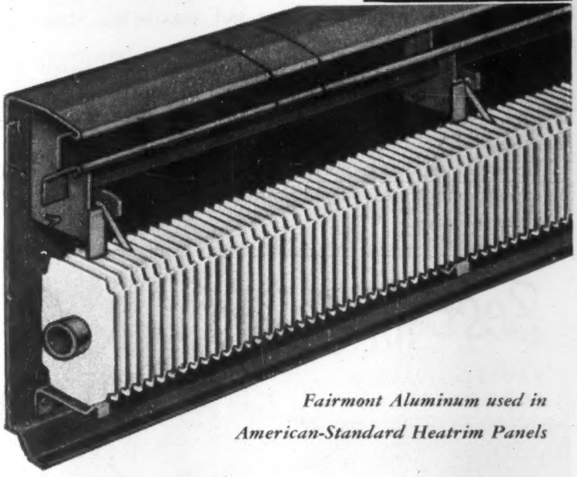
- Long life hardened metal ball inner valve
- Trouble-free one-piece metal bellows
- Built-in overheat protection
- Generous 50° adjustment range
- Quick, uniform throttling action
- Positive, tight closing
- Wide selection of temperature ranges

For dependable, low-cost temperature control, select this NEW Klipfel Thermostatic Valve ... perfected to give the service you want with accuracy, dependability and minimum maintenance.

Klipfel VALVES, INC.
1075 Lincoln Ave. Hamilton, Ohio

Better Yet,

USE FAIRMONT aluminum



Fairmont Aluminum used in American-Standard Heatrim Panels

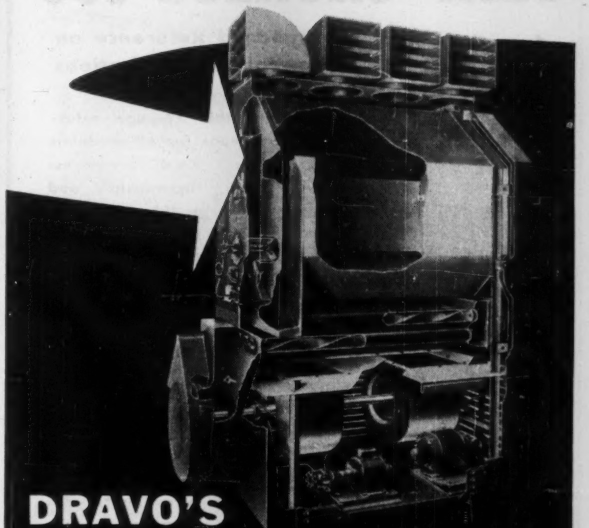
In baseboard heating units, and in all better parts and accessories for heating and cooling applications, Fairmont 2S, 3S and 52S wrought aluminum sheet is nationally recognized for highest quality and uniformity. Improved appearance, high thermal conductivity, light weight, wear-resistant ductility, and non-corrosive and stainproof surfaces—all these objectives and more are readily achieved.

Fairmont bright aluminum rolling mill products—sheet, coil and circles, are now available for prompt delivery to meet manufacturing schedules.

FALCO

FAIRMONT
ALUMINUM COMPANY
•
Fairmont, West Virginia

another DRAVO HEATER plus



DRAVO'S
oversized combustion chamber flexes its muscles

Dravo's stainless steel combustion chamber is widely imitated, but the extra value that Dravo engineering gives you is still an exclusive "*plus.*"

OVERSIZE . . . Dravo's *larger* combustion chamber delivers rated output, with metal temperatures never exceeding ½ to ¾ of scaling temperatures. Oxidation of chamber walls is reduced. Result . . . longer service life for you.

FLEXES ITS MUSCLES . . . The floating feature allows Dravo's combustion chamber to freely expand and contract, eliminating dangerous stresses and strains. Special supports permit the unit to be mounted in any position.

Couple these features with the many other advantages offered by Dravo Heaters and you see why dollar for dollar, year for year, your best heating investment is Dravo Heaters.

Mail the coupon for more information.

DRAVO CORPORATION, Heating Department
Fifth and Liberty Avenues, Pittsburgh 22, Penna.

DRAVO

Please send me complete information about the Dravo:

☐ ***Counterflo* Space Heater** ☐ ***Paraflo* Space Heater**
☐ ***Gas Fired* Unit Heater**

☐ Please have a representative call at no obligation to me.
Ask for Bulletin HI 598-7980.

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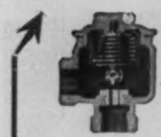
TRAP CATALOG 953

A Standard Reference on Traps for All Applications



Newly revised, this 32-page reference describes traps for all mediums and pressures: thermostatic and metal expansion for pressures to 250 lbs.; weight and piston-operated for heavy duty. Complete with installation diagrams and formulae for determining proper size trap.

NICHOLSON STEAM TRAPS
CATALOG NO.
W. H. NICHOLSON & CO.
WILKES-BARRE, PA.

TRAP DATA *at your fingertips*

W. H. NICHOLSON & CO.

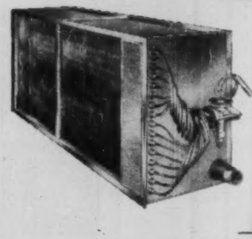
TRAPS · VALVES · FLOATS
198 OREGON ST., WILKES-BARRE, PA.

Industry Had Acid Vapor Heating and Cooling Problems

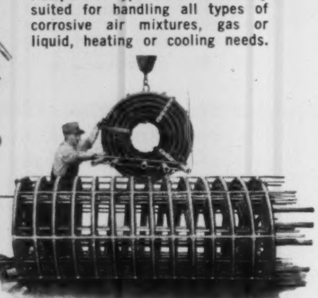
REMPE

Solved Them With...

FIN AND PIPE COILS OF STAINLESS STEEL



Rempe Fin Type Coils are ideally suited for handling all types of corrosive air mixtures, gas or liquid, heating or cooling needs.



We have complete facilities and tested technique in the fabrication, welding and finishing of pipe coils made from all types of stainless steel.

Send details or blueprints for engineering advice and quotations on your requirements, for all types, all materials of pipe and fin coils.

REMPE COMPANY

342 N. Sacramento Blvd., Chicago 2, Ill.

NEW BOOKS & REPORTS

Continued

Application and Installation of Compression Refrigeration Systems, 35 cents; Standards for Insulation for Cold Storage Rooms, Location and Inspection of Data Plates on Insulated Refrigerant-Containing Vessels, and Steel and Wrought Iron Pipe, 35 cents; Tentative Application Engineering Standard for Year-Round Residential Air Conditioning, 50 cents.

Copies of the Standards are available from the Air-Conditioning and Refrigeration Institute's headquarters at 1346 Connecticut Ave., N.W., Washington 6, D.C. A complete bound set of all the Standards is priced at $5.00.

Design of Aluminum Duct Systems

A new booklet, entitled *The Design of Aluminum Duct Systems,* to give engineers and contractors practical and authoritative data on friction losses in air conditioning duct systems, has been published by Kaiser Aluminum & Chemical Sales, Inc.

The 32 page technical booklet was prepared by F. W. Hutchinson, prominent heating and ventilating engineer and a consultant for Kaiser Aluminum.

Information contained in the publication is based on research done by Mr. Hutchinson and presented in a paper by him at an annual meeting of the American Society of Heating and Ventilating Engineers.

The paper reports experimental tests which demonstrated the great smoothness of aluminum and consequent drop in friction losses.

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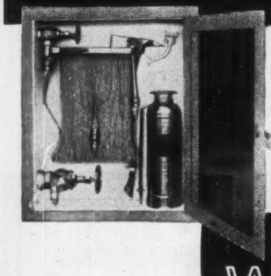
PROVED RELIABLE, ECONOMICAL

ALLENCO

INTERIOR FIRE-PROTECTION EQUIPMENT

Complete Line — 480 Cabinets Alone
Modern, Most Widely Used



Easiest for you

Reliable Delivery—
Goes in Easier

SINCE 1887

W. D. ALLEN
Manufacturing Co.
CHICAGO 6 · NEW YORK 7

The major features of the design aid include two friction loss charts based on exact, experimentally-determined aluminum roughness characteristics and identical in form to those published for galvanized iron in the ASHVE GUIDE. Engineers familiar with THE GUIDE charts will find no trouble with these new charts for aluminum. Also included are graphical solutions for determining friction losses through fittings and charts for calculating required air volumes and rates of heat loss for ducts.

The use of aluminum is desirable, the study shows, for modern higher velocity systems because reduction in friction losses increases directly with velocity and inversely with diameter.

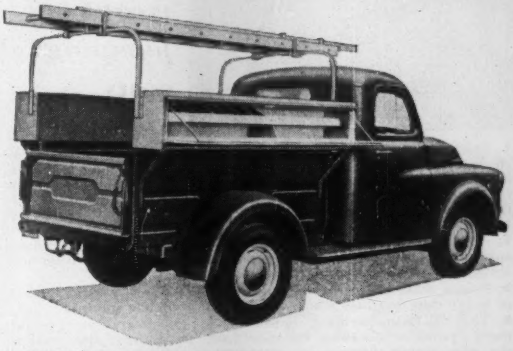
The concluding section of the booklet presents detailed step-by-step design procedures and recommendations for sizing round or rectangular ducts for heating, ventilating, or air conditioning systems.

The booklet is available from Kaiser Aluminum & Chemical Sales Inc., 1924 Broadway, Oakland, Calif.

Metals and How to Weld Them

Metals and How to Weld Them is a combination text and reference book to give users of welding a practical working knowledge and source of information for designing and making better welds at a lower cost. The authors, T. B. Jefferson and Gorham Woods, have written this book for the student, welding operator, supervisor, instructor, engineer, designer and manager. It explains in detail the

STAHL SIDE BOXES



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TO A MODERN SERVICE TRUCK!

Quickly...and at low cost...you can mount these All-Steel, Welded Side Boxes on ANY MAKE OR MODEL of pick-up truck. Keep tools and equipment dry, safe, organized.

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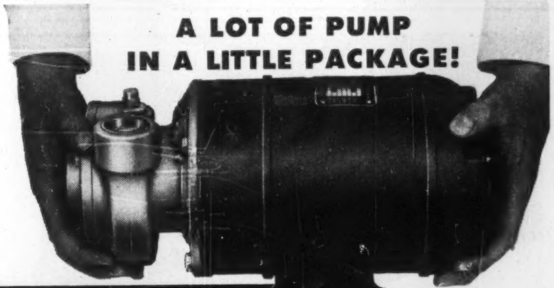

A LOT OF PUMP IN A LITTLE PACKAGE!

BJ NEW FRACTIONAL HORSEPOWER BILTON PUMPS

...WITH BJ MECHANICAL SEAL AS STANDARD EQUIPMENT!

Meet the mighty midgets of the BJ Bilton family. They offer capacities up to 100 GPM and heads up to 100 ft.... yet the largest measures only 16 inches in length! Mount in any position... need no base plate... pump case may be rotated for horizontal or vertical discharge... no stuffingbox problems. Temperatures to 150° F and suction pressures to 75 psi can be handled. Quick delivery.

APPLICATIONS:
- *Air conditioning*
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- *Coolant oil*
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- *and countless other general purpose pumping jobs*

Byron Jackson Co. PUMP DIVISION

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Quality Pumps Since 1872

SPECIAL
DELIVERY

of the reduced pressure you want!

. . . with this STANDARD valve

Here is a standard diaphragm regulator that can handle your special pressure control requirements. It is furnished in a wide range of sizes, types (self-contained, instrument or pilot control), bodies, and trim, to your specification. For water, oil, steam, air or gas. No. 119 single seated, No. 114 double seated, sizes ½" to 6", screwed, standard or extra heavy flanged. Direct or reverse acting. Tested and approved by leading engineers and contractors — the answer to your regulator problems.

No. 114 & No. 119 REGULATOR
- **Pressures to 300 psi reduced to zero.**
- **Bronze, semi-steel or steel bodies**
- **Spring loaded, interchangeable diaphragms**
- **For water, oil, steam, air or gas**

WRITE FOR CATALOG NO. 54-F

KECKLEY

pressure regulators • float boxes
temperature regulators
pop safety valves • relief valves
float valves • balanced valves
pump governors • strainers

1914 **O. C. KECKLEY CO.** *1954*
400 W. Madison Street • Chicago 6, Illinois
40th Anniversary

structure and properties of metals and how to weld them.

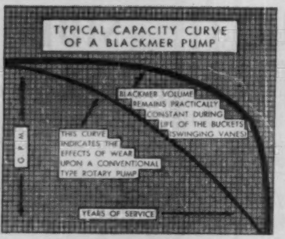
The first six chapters are devoted to an elementary discussion of metals, their mechanical and physical properties and uses. The fundamentals of metallurgy and their significance in heat treating and welding are explained. This information is then related to correct welding procedures for steels, cast iron, nonferrous materials and hardfacing. All commonly used types of metals are covered. The final section of the book is devoted to information for making good welds, trouble shooting, cost estimating and an explanation of welding terms.

The 322 page book is priced at $2.00 in the United States and $2.50 elsewhere. Publisher is The James F. Lincoln Arc Welding Foundation, 22801 St. Clair Ave., Cleveland 17.

OTHER BOOKS AND REPORTS . . .

THE INFLUENCE of CORROSION on the CRACKING of PRESSURE VESSELS, H. R. Copson, International Nickel Co. — review of the theories and assumptions advanced to explain the failure by corrosion of metals under stress. The author differentiates between stress corrosion cracking, corrosion fatigue, local attack, intergranular attack, effect of stress on general corrosion and effects of hydrogen generated by corrosion. In addition, he outlines fields of future research.

The article originally appeared in the journal of the American Welding Society and was later reprinted in the journal of the National Association of Corrosion Engineers.



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1. Blackmer's swinging and sliding vane principle assures maximum efficiency, positive priming characteristics, and continuing high rate of delivery. Metallic or composition vanes which are self adjusting for wear insure peak performance through years of hard use. When the vanes finally wear, it is easy to replace them and restore the pump to normal capacity in a matter of minutes.
2. The Blackmer design also features replaceable cylinder liners enabling pumps operating under severe conditions or corrosion and abrasives to be renewed at minimum cost.
3. Proper shaft alignment and easy maintenance result from the use of heavy duty bearings which are isolated from the pumpage.
4. The Blackmer pressure control valve, an integral part of the pump, provides minimum variation from set pressure and protects the unit against damage by accidental shut-offs in the discharge system.
5. Pumps are available with speed reduction equipment for operation by all types of power drives (Motors, Engines, Turbines, etc.)
6. Blackmer rotary pumps supply the answer to a wide range of LIQUID MATERIALS HANDLING problems involving delivery to 1500 GPM — viscosities through 100,000 SSU — discharge pressures through 150 PSI — temperatures to 600°F.

liquid materials handling

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Industrial, Hand and Truck Pumps, Strainers, Pressure Control Valves
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Heating Piping & Air Conditioning

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MEETINGS AND CONVENTIONS...

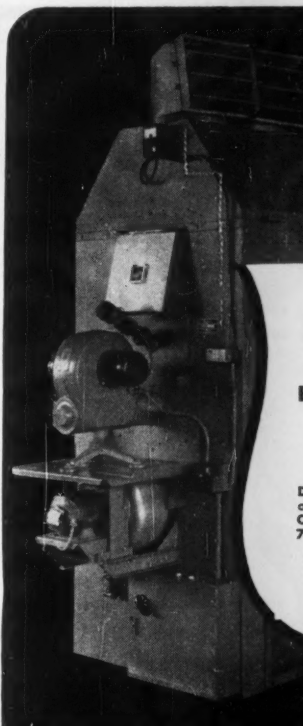
1954 *NATIONAL PLASTICS EXPOSITION*, sponsored by the Society of the Plastics Industry Inc., 67 W. 55th St., New York 36—technical conference and exposition, June 7-10, Public Auditorium, Cleveland. Refrigeration and air conditioning manufacturers will take part in the program.

ILLINOIS INSTITUTE OF TECHNOLOGY, two week refresher course in "Basic Oil Hydraulics," June 7-18. The course is designed for maintenance technicians and others already working in the hydraulics field.

Further information about the summer course may be obtained from the Dept. of Mechanics, IIT, 3300 S. Federal St., Chicago 16.

AMERICAN SOCIETY FOR TESTING MATERIALS, 1916 Race St., Philadelphia 3—annual meeting, June 13-18, Sherman and Morrison Hotels, Chicago. The meeting will include the Eleventh Exhibit of Testing and Scientific Apparatus and Laboratory Supplies and the Ninth Technical Photographic Exhibit. Among the papers to be presented at the Symposium on Odor are, "Odor: A Proposal for Some Basic Definitions," "The Design, Construction, and Use of an Odor Test Room," and "Odor Control Methods."

AMERICAN SOCIETY FOR ENGINEERING EDUCATION—62nd annual meeting, June 14-18, University of Illinois, Urbana.



HEAT when and where you need it — at the flip of a switch.

SAVE on low initial cost, simple installation and efficient operation.

ENJOY fully automatic controls and years of dependable performance.

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Direct Fired Unit Heaters for gas, oil, coal or dual gas and oil. Capacities from 300,000 to 7,500,000 B.T.U. per hour.

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Write for free catalog and complete information.

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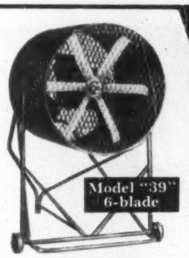

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Aerovent
Mancooler
FANS

for spot cooling of men and machines
drying • exhausting • general ventilating

Beat heat and production lags this summer with Aerovent Portable Mancoolers. Pedestal, cradle and wheeled models — all adjustable for 180° directional air discharge. Heavy-duty welded construction. Sizes 24" to 48" for capacities to 40,000 C. F. M.

other models for every air-moving requirement

All Aerovent Fans are rated in accordance with the Standard Test Code and U.S.D.C. Comm. Std. CS178-51.

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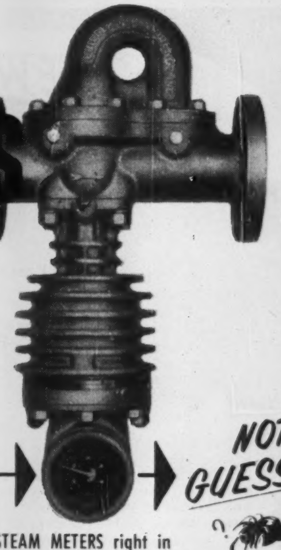

NOT GUESSES

Install **BUILDERS SHUNTFLO STEAM METERS** right in your steam lines. Keep track of steam costs by seeing where steam is going and how much. Shuntflo Meters available in Model SMKS (shown) for 2" to 14" lines — Model SMDH for 1" and 1½" lines. **Write for Shuntflo Bulletins. Builders-Providence, Inc. (Division of B-I-F Industries, Inc.), 381 Harris Ave., Providence 1, R. I.**

BUILDERS-PROVIDENCE
DIVISION OF B-I-F INDUSTRIES, INC. — METERS FEEDERS CONTROLS

go to a *SPECIALIST* for helical finned heat transfer tubing

- straight lengths
- compact coils for refrigeration condensers
- blast air heating coils
- blast air cooling coils

OVER 100 SIZES IN PRODUCTION

Made to your individual specifications!

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NEW

COMBINATION BURNER FOR BOILER CONVERSIONS!

Complete, with all accessories

● New Eclipse Fan-Type Combination Gas-Oil Burner gives you peak efficiency with mixed, natural or LP gas (800 Btu to 3200 Btu)... #1, 2, or 3 fuel oil. Snap switch changes burner instantly to fuel selected . . . automatically sets all necessary controls in operation. "Cleanfire" starting delays fuel until blower delivers correct air for perfect combustion. Direct, electric spark ignition for oil—pilot ignition for gas. Safe, positive starting. Electronic control provides 100% efficient flame-failure protection. New built-in tuyere completes exclusive "rotary flame" action of burner. It's a complete burner installation. There's nothing else to buy or install. High quality construction assures years of heating service. Capacities from 400,000 to 2,250,000 Btu. Representatives in all principal cities.

Write for Eclipse Bulletin R-100

ECLIPSE FUEL ENGINEERING CO., 1139 BUCHANAN ST., ROCKFORD, ILL.
ECLIPSE FUEL ENGINEERING CO. OF CANADA, LTD., TORONTO, ONTARIO

MEETINGS & CONVENTIONS

Continued

I-B-R SCHOOL OF MODERN HEATING—schedule of schools being held during June includes: Rochester, N.Y. Rochester Chamber of Commerce, 55 St. Paul St., June 15-17; Pittsfield, Mass., Hotel Sheraton, June 22-24; Boston, Boston Consolidated Gas Co., 100 Arlington St., June 29-July 1. Tuition is $28. Those wishing further information may obtain it from the Institute of Boiler and Radiator Manufacturers, 60 E. 42nd St., New York 17.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, 62 Worth St., New York 13—Semi-Annual Meeting, June 28-30, New Ocean House, Swampscott, Mass.

HEAT TRANSFER — two week summer course at Massachusetts Institute of Technology on modern developments in heat transfer, July 6-16. The course will cover fundamental concepts and recent findings in the field of heat transfer. It has been designed to fill the needs of teachers, research workers and development engineers.

Tuition for the course is $160. Application blanks and further information are available from the Summer Session Office, Room 7-103, MIT, Cambridge 39.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS, 234 Fifth Ave., New York 1—41st semi-annual meeting, July 11-14, Hotel Olympic, Seattle, Wash.

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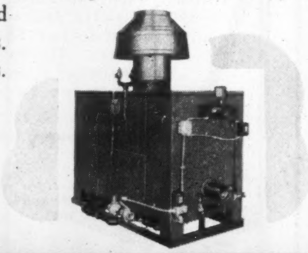

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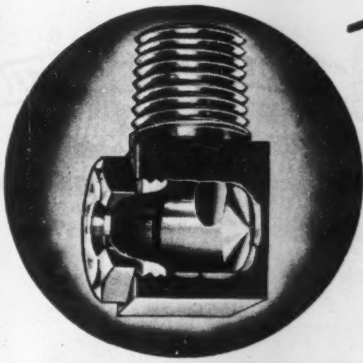
MEETINGS & CONVENTIONS

Continued

WESTERN PLANT MAINTENANCE SHOW, 759 Monadnock Bldg., San Francisco 5—West's first plant maintenance show, July 13-15, at the Pan Pacific Auditorium, Los Angeles. Produced by Clapp & Poliak, Inc., the show will emphasize the specialized problems of maintenance and engineering faced by western industry which has undergone tremendous expansion since World War II. The food processing industry in the West will be the subject of several demonstrations and discussion groups. One of the problems to be discussed is how to handle air conditioning where certain control processes are involved.

The *NATIONAL WARM AIR HEATING AND AIR CONDITIONING ASSOCIATION*—remaining short course in the 1954 series will be held July 13-16 at the University of Wisconsin. Tuition is $25. Further information is available from Prof. R. C. Tegtmeyer, Mechanical Engineering Dept., Madison.

INSTITUTE OF BOILER AND RADIATOR MANUFACTURERS, 62 E. 42nd St., New York 17—short courses in boiler heating at Purdue University and the University of Illinois. The short course in hot water and steam heating at Purdue will be held during the week of July 19. It will be an elementary course emphasizing the



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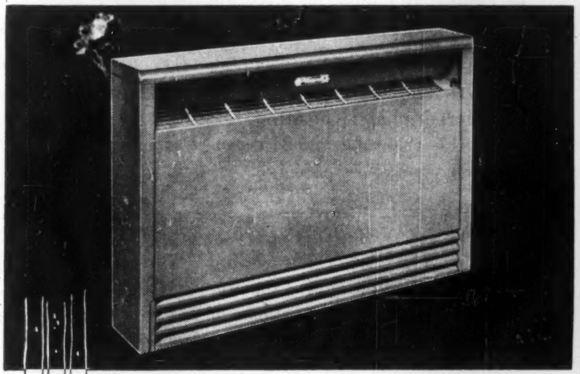

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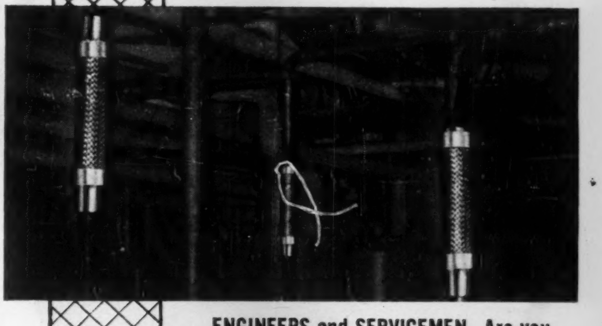

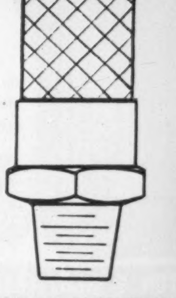

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MEETINGS & CONVENTIONS

Continued

principles of design and installation based on the I-B-R installation guides.

The short course at Illinois is scheduled for the week of July 26. It will be an advanced course with emphasis on summer cooling in connection with hot water and steam heating systems. Students wishing further information may write to R. K. Newton, Supervisor of Engineering Extension, Room 116, Illini Hall, 725 S. Wright St., Champaign, Ill.

INTERNATIONAL INSTRUMENT CONGRESS AND EXPOSITION, 845 Ridge Ave., Pittsburgh 12. A number of professional societies are participating in making plans for the meeting to be held in Philadelphia. Technical sessions are scheduled to begin September 13 and continue until September 25.

EIGHTH NATIONAL CHEMICAL EXPOSITION, The American Chemical Society, Chicago Section, 86 E. Randolph St., Chicago 1—Chicago Coliseum, October 12-15. Theme of the exposition is "The Chemical Industry in Everyday Living."

FIRST INTERNATIONAL AUTOMATION EXPOSITION, 845 Ridge Ave., Pittsburgh 12—exhibit on automatic machines, factories and industries to be held the week of November 29 at the 242nd Coast Artillery Armory, 14th St. off Sixth Ave., New York.

The exhibit is under the direction of Richard Rimbach.

21st *NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING*, under the management of the International Exposition Co., 480 Lexington Ave., New York 17—Commercial Museum, Philadelphia, December 2-7.

INTERNATIONAL HEATING & VENTILATING EXPOSITION—The Air Conditioning Exposition, January 24-28, 1955, Commercial Museum & Convention Hall, Philadelphia. Under the auspices of the American Society of Heating and Ventilating Engineers, and under the management of the International Exposition Co., 480 Lexington Ave., New York 17.

GAS MEASUREMENT—14th annual Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, August 23-25. Subjects to be covered include fundamentals of gas measurement and special sessions on domestic meters, large capacity meters, orifice meters, auxiliary measurement instruments, automatic control instruments, planning and design of installations, and pressure regulators, motor valves and related equipment.

NATIONAL ASSOCIATION OF CORROSION ENGINEERS, Tulsa Section—Sixth Annual Corrosion Short Course for Pipeliners, February 16-18, 1955, Mayo Hotel. Thomas M. Ragland, Phillips Petroleum Co., is chairman of the course.

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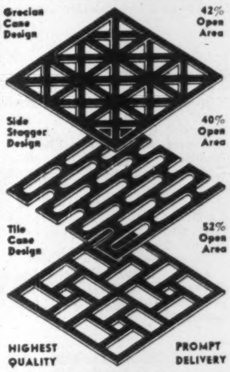

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WANTED: DESIGN ENGINEER — Fast growing midwestern manufacturer of ventilating and allied products has exceptional opportunity for mechanical engineer with design and development ability. Give complete background. Our employees know of this advertisement. Address Key 1101A, Heating, Piping & Air Conditioning, 6 North Michigan Avenue, Chicago 2, Ill.

AIR CONDITIONING ENGINEER — National manufacturing concern offers exceptional opportunity to experienced air conditioning engineer. Work will involve product development in Research Department of multi-plant organization. Must have 3 to 5 years experience in air conditioning or related work and should have ability to transfer ideas to drafting board as required. Age 25 to 40, with engineering degree preferred. Salary open. Send complete resume and snapshot, if available. Address Key 1103A, Heating, Piping & Air Conditioning, 6 North Michigan Avenue, Chicago 2, Ill.

HEATING ENGINEER — Experienced heating engineer required by national manufacturer of gas heating equipment. Duties involve product development and testing. Three to five years experience and knowledge of AGA testing procedures required. Salary open. Send resume to Key 1104A, Heating, Piping & Air Conditioning, 6 North Michigan Avenue, Chicago 2, Illinois.

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WANTED: SURPLUS THERMOSTAT CONTROLS for gas furnaces; room thermostats, solenoid valves, etc. Address Key 1098A, Heating, Piping & Air Conditioning, 6 North Michigan Avenue, Chicago 2, Illinois.

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MECHANICAL ENGINEER for general building contractor. Excellent opportunity and permanent position with young, expanding company. Must be capable of estimating and analyzing subbids received from mechanical and electrical subcontractors and supervise and expedite work after subcontract awarded. Write full particulars, including education, experience, personal details, and salary requirements to: BLOUNT BROTHERS CONSTRUCTION COMPANY, Post Office Box 1144, Montgomery, Alabama.

Aggressive Salesman experienced in the sale of Heating Equipment wanted by Manufacturer of Boilers and Radiators for Cincinnati, Dayton, and Louisville territory. Send qualifications to R. W. Fowler, Burnham Corporation, Zanesville, Ohio. All replies confidential.

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HEATING AND AIR CONDITIONING ENGINEER — Age 34, M. E., registered, desires responsible position with progressive concern located South or West. Ten years experience. Full knowledge of design, estimating, sales, and administration. Complete knowledge of servicing. Teaching experience. Familiar with manufacturing processes. I know the business. Do you need me? Address Key 1097A, Heating, Piping & Air Conditioning, 6 North Michigan Ave., Chicago 2, Ill.

Well known sales executive for nationally known Equip. Mfgr. desires change — Age 32, family man. Travel, $15,000 minimum or exclusive territory as Manufacturer's Agent Miss. Valley. Address V-Ann-K L.P. P. O. Box 24, St. Louis 19, Mo.

HEAD OF RESEARCH and development, Ph.D., M.S., B.S. in Mech. Eng. Specialist in Heat Transfer and Air Conditioning. 5 years experience in industrial research including some administration and technical direction, 4 years teaching and basic research. Desires responsible position. Address Key 1099A, Heating, Piping & Air Conditioning, 6 North Michigan Ave., Chicago 2, Ill.

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Established Mfg's Representatives New York and Conn. area, wishes to add to line a major product in the Heating and Air Conditioning field. Contacts among the Contractors and Engineers in this area. Address Key 1096A, Heating, Piping & Air Conditioning, 6 North Michigan Avenue, Chicago 2, Ill.

Established Mfr's Agents, New York area, wish to add to present line a major line of heating, ventilating or air conditioning equipment. Twenty-five years experience, good reputation, identified with many major projects. Contacts among Engineers, Contractors and Industrials. If interested, forward information pertaining to your product. Address Key 1077A, Heating, Piping & Air Conditioning, 6 North Michigan Avenue, Chicago 2, Ill.

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Manufacturer's Agents required by well known manufacturer of STEAM, GAS AND OIL FIRED UNIT HEATERS. HEATING AND VENTILATING UNITS. CONVECTOR RADIATORS. Territories open in several sections of the United States. Airtherm Manufacturing Company, 711 South Spring Avenue, St. Louis 10, Missouri.

AGENTS WANTED — Exclusive territorial franchises Central Illinois and Montana available for established representative handling our heating and ventilating units, air conditioners, heating and cooling coils, unit heaters, and other heat transfer products. A leader in the industry for over 20 years. MCQUAY, Inc., 1600 Broadway, N.E., Minneapolis 13, Minnesota.

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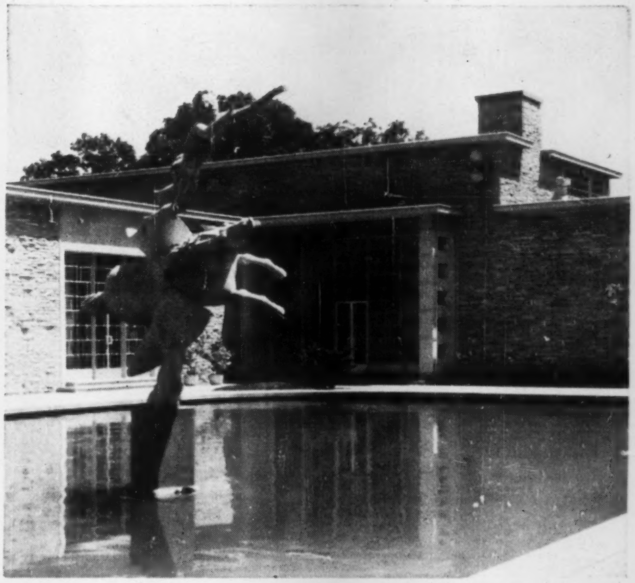

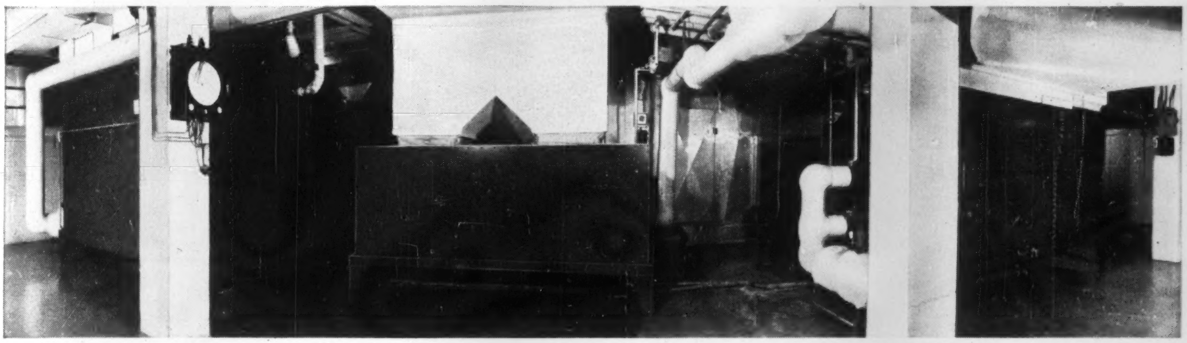

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A realistic approach to art—the new Des Moines Art Center. A realistic approach to year-'round comfort—Clarage Multitherm conditioning units.

Here, as in so many other notable buildings throughout the nation, Clarage Multitherms were chosen for their recognized ability to give **reliable** service . . . year after year . . . with utmost economy.

Two Blow-Thru units and a Draw-Thru unit do double duty—cooling and dehumidifying when the mercury goes up; heating and humidifying when the mercury goes down. The same equipment working 'round-the-calendar reduces initial cost; minimizes maintenance.

For comfort or process conditioning applications, this Clarage equipment merits your investigation. Vertical and horizontal types . . . capacities 600 to 20,500 c.f.m. To learn more, simply request Catalog 1307A. **CLARAGE FAN COMPANY, Kalamazoo, Mich.**

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SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • *IN CANADA:* Canada Fans, Ltd., 4285 Richelieu St., Montreal

"You can't be safe by accident"

In the old days, when relief valves went by pipe sizes instead of discharge capacity, you might "accidentally" get a relief valve adequate for the job — particularly if you had an "open system."

But with the increase in the use of closed systems—and to prevent real accidents resulting in damaged boilers—the casualty companies, National Board, and others went to work . . . hence the present ASME Code calling for Btu.-rated relief valves.

It is no "accident" that McDonnell Relief Valves offer the maximum safeguard against over-pressure for hot water space heating boilers, hot water tanks, and heaters. They were the first Btu.-rated valves . . . and they are still first in design, workmanship, quality, and on-the-job dependability.

In the McDonnell 230 series you have a relief valve for practically every job. Note, the range of capacities and sizes listed below.

McDONNELL & MILLER, *Inc.*, 3500 N. Spaulding Ave., Chicago 18, Ill.

Doing One Thing Well

McDONNELL 230 Series ASME Pressure Relief Valves

The accompanying table tells the story. For hot water space heating boilers the precision-built, dependable McDonnell 230 Series has been expanded to cover the large boilers as well as the small ones. In addition to the ¾" valve, the series now includes 1" and 1½" sizes for larger boilers. For still larger boilers there are the manifold assemblies—dual valves with a common inlet. These offer the very real advantage of *keeping discharge in step with actual need* . . . a smaller valve, opening at 30 lbs., to take care of thermal expansion and a big valve, set at a slightly higher pressure, ready for any emergency.

For use on hot water tanks and heaters, McDonnell 230 Series Valves are available with standard opening pressures as listed and manifold assemblies are also available for large jobs.

All of these valves are designed and built to ASME requirements and have been tested, Btu.-rated, and certified by the National Board of Boiler and Pressure Vessel Inspectors.

Your Jobber Stocks Them

For Hot Water Space Heating Boilers

Boiler Size Btu./hr.	McDonnell Valve No.	Opening Pressure	Outlet	Inlet
303,000	230 ¾ Inch	30 lbs.	¾"	¾"
743,400	230 1 Inch	30 lbs.	1"	1"
1,025,100	230 1½ Inch	30 lbs.	1½"	1½"
1,488,000	230 M-1 Includes 230 ¾ Inch 230 M36	30 lbs. 36 lbs.	¾" 1½"	2"
1,928,400	230 M-2 Includes 230 1 Inch 230 M36	30 lbs. 36 lbs.	1" 1½"	2"
2,150,400	230 M-3 Includes 230 1 Inch 230 M45	30 lbs. 45 lbs.	1" 1½"	2"

For Hot Water Tanks and Heaters

Opening Pressure	McDonnell Valve No.	Capacity Btu./hr.	Outlet	Inlet
75 lbs.	230-75	502,000	¾"	¾"
100 lbs.	230-100	640,000	¾"	¾"
125 lbs.	230-125	783,000	¾"	¾"
150 lbs.	230-150	925,000	¾"	¾"

McDONNELL

Boiler Safety Devices